

Improving Quality of Life for Children with Cochlear Implantation at Beni-Suef City

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Abstract

Background: Pediatric cochlear implantation affects not only communication skills such as speech recognition, speech production, and language use but also interactions with others and how children feel about themselves, so cochlear implantation is highly improved in different quality of life aspects among children with hearing loss. **Aim:** the study aimed to improve the quality of life for children with cochlear implantation. **Design:** a quasi-experimental design was utilized in the current study. **Sample:** a convenient sample of a total 160 of mothers and 160 children after cochlear implementation was randomly divided equally into two groups, (control group and study group. **Setting:** The study was conducted at Ear, Nose, and Throat outpatient clinics at Beni-Suef University Hospital. **Tools:** Two tools were utilized to collect data for the current study. **The first tool: the Structured** interviewing questionnaire sheet had four parts, mothers' socio-demographic characteristics, children's sociodemographic characteristics, knowledge, and self-reported practice of mothers' assessment for their children with cochlear implantation, **The Second Tool** was the children's Quality of life questionnaire. **Results:** the study findings revealed that 87.5% of the mothers in the study group had a good level of knowledge as compared with 12.5% of mothers in the control group, 85.0% of the children in the study group had a high level of quality of life as compared with only 10.0% of children in the control group, and 88.8% of the studied mothers in the study group had a satisfactory level of practice toward caring their children. **Conclusion:** the educational intervention program is positively improving the studied mothers' knowledge and practice about caring for children with cochlear implementation subsequently improving the quality of life of the cochlear implementation children on average. **Recommendation:** a training program for mothers about caring for their children after cochlear implementation is highly recommended.

Keywords: Quality of life, Cochlear implementation.

Introduction

Severe and profound childhood hearing loss is a medical condition that affects the functional development of the brain (Binose et al., 2021) and quality of life (QoL). Untreated childhood hearing loss can have consequences beyond the acquisition of spoken language. Not only communication and social interaction (Lieu et al., 2020), as well as self-image, can be affected, but also cognition and school performance, with possible adverse consequences for the QoL. Therefore, the rehabilitation of children with hearing loss aims to restore hearing ability and optimize developmental potential to enhance the QoL (Lieu et al., 2020).

A cochlear implant (CI) is an electronic medical device that provides auditory access to speech sounds that cannot be supplied by sound amplification through conventional hearing aids in individuals with severe and profound hearing

loss. Early application of CI facilitates spoken language acquisition (Binose et al., 2021) and promotes participation in mainstream education. Since 1989, when the USA Food and Drug Administration approved cochlear implants for children with severe-to-profound hearing loss, this technology has developed so fast that today cochlear implantation is the treatment of choice for children diagnosed with severe-to-profound hearing loss in the majority of developed countries (Lieu et al., 2020). Numerous trials demonstrated the advantages of CI: improved hearing, speech perception, and language development (Dettman et al., 2016). In addition, CIs seem conducive to the psychosocial prerequisites (e.g., empathy) for social participation. In children, the use of CI can at least partly reverse the effects of hearing loss on the brain (Binose et al., 2021).

Several studies reported positive correlations between these CI-specific benefits and the QoL of children and adolescents with hearing loss, such as speech recognition (especially in noisy environments) and spoken language skills and academic achievement (**Dazert et al., 2020**).

Health-related QoL, which we refer to as QoL, encompasses the physical and psychosocial aspects of an individual's perception of their position in life (**World Health Organization, 1994**).

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 the QoL of children with hearing loss increases after receiving auditory rehabilitation alongside their hearing device such as a hearing aid or cochlear implant (**Ronner et al., 2020**).

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 family receptiveness (**Moradietal., 2022**).

The retrospective study of (**Warner-Czyz et al. 2022**), compared the parent-reported cochlear implant-specific quality of life summary data across 14 published studies spanning 11 countries and nine languages." Across countries, social and communicative interaction abilities were appraised most positively. The largest differences were found in the communication domain. The authors assumed that limited access to cochlear implantation and rehabilitation, cultural differences in awareness of hearing loss, and differing expectations might explain these differences in parental ratings on the QoL.

The community health nurse had a pivotal role in educating parents/caregivers regarding cochlear implant surgery to improve

knowledge and practice toward caring for children after surgery, this will enable mothers or / caregivers to provide care for their children, and help to have improved quality of life of children after surgery.

Significance of the study:

Hearing loss is one of the most common birth defects. It is the third leading chronic disability following arthritis and hypertension. Hearing impairment is a pervasive disability affecting nearly 250 million people in the world, and 75% of sufferers live in developing countries (**Almeida, et al., 2019**). There is no database about the magnitude and distribution of the hearing impairment problem in Egypt. A few academic studies confined to specific age groups or certain geographical areas have been conducted. The prevalence of hearing loss in schoolchildren was found to be 5.3% in Alexandria, 4.5% in rural areas, and 13.7% in Ismailia governorate.

The impact of CI on children and their mothers with severe or profound hearing loss goes beyond improvements in the perception and production of speech and language development, thus encompassing physical and mental health, that is, QOL (**Moradiet al., 2022**).

Mothers can provide information on a variety of situations to which children are exposed, such as school, daily routines, and familial relationships, enabling a description of CI outcomes in children. Moreover, mother can provide a good evaluation of the process of therapeutic intervention evolution with their children. Their satisfaction is a marker for the development of children and shows that CI reaches or exceeds intervention expectations (**Daniel & Vedat Topsakal, 2020**). So, the current study aimed to assess mothers' awareness about the quality of life of their children with cochlear implantation.

Aim of the study:

This study aimed to improve the quality of life for children with cochlear implantation by achieving the following objectives:

1. Improving knowledge of mothers about cochlear implantation
2. Improving mother's care for children after cochlear implantation

Research hypothesis:

H₁-Quality of life for children be improved after the implementation of the health education program?

H₂-The knowledge of mothers be improved after implementation of the health education program?

H₃-The care provided to children will be improved after the implementation of the health education program?

Subjects and Methods:

The methodology is portrayed according to the four following designs

- I. Technical design
- II. Administrative design
- III. Operational design
- IV. Statistical design

I- Technical Design:

The technical design will be portrayed according to the four following items: research design, setting, subjects, and tools of data collection.

Research Design:

A quasi-experimental design was utilized in this study.

Setting:

The study was conducted at Ear, Nose, and Throat (ENT) outpatient clinics at Beni-Suef University Hospital.

Sample size:

The researcher took all available mothers who attended the ENT outpatient clinics at Beni Suf University Hospital with their children (1.5 to 5 years) after cochlear implantation for six months.

Sample type: Convenient sample.

Inclusion criteria:

Children (1.5 to 5 years) after cochlear implantation for six months.

Exclusion criteria:

Children who had medical diseases.

Tools for data collection:

Two tools were utilized to collect data for the current study.

Tool I: Structured interviewing questionnaire sheet:

This tool was developed by the investigator after reviewing the national and international related literature (Cejas and Quittner, Silva et al., 2020; 2018; Warner-Czyz et al. 2022). It consisted of four parts:

Part I: Mothers' Socio-demographic characteristics:

This part was concerned with studying mothers' characteristics such as age, and marital status, level of education, occupation, residence, family type, and number of home rooms.

Part II: Children characteristics: This part was concerned with personnel of children such as age, gender, type of hearing impairment, and presence of chronic diseases.

Part III: Mother's knowledge questionnaire sheet:

was designed by the researchers to assess mothers' knowledge about cochlear implementation and their care for children after cochlear implantation including the meaning of hearing impairment, the definition of a cochlear implant, signs, and symptoms of hearing impairment ... etc.

Scoring System:

The mother's answers related to their knowledge were scored and calculated. Each correct had several correct answers and mothers were asked to select all the corrected answers, and the mean score for each question was calculated.

Total knowledge was scored as follows:

Poor knowledge -----<60% of total knowledge score.

Average knowledge -----60- <75% of total knowledge score.

Good knowledge -----> 75% of total knowledge score.

Part VI: self-reported practice assessment tool to evaluate mothers' self-reported practice about caring for their children with cochlear implantation: This tool was developed by researchers after reviewing the national and international related literature.

Scoring System:

Mother self-reported practice response to each practice statement to care for their children after cochlear implantation was scored as (do = 1, not do = 0).

The total self-reported practice score was determined as:

Unsatisfactory practice -----
<60% of total practice score

Satisfactory practice. ----->60%
of total practice score

Tool II: Children's Quality of Life Questionnaire Sheet: This tool was constructed to assess the quality of life of children after cochlear implantation. It was developed by (*Patrick et al., 2011*), and it was translated into Arabic language and adapted from (*Nada et al., 2021*). This questionnaire was designed with 11 subscales and 58 questions in total.

Scoring System:

The mother's answers related to the quality of life of children after cochlear implantation will be scored and calculated. Answers will be given a score from one to five according to the following (totally agree = 5, agree = 4, no differences = 3, not agree = 2, absolutely disagree = 1).

The total quality of life score was determined as:

Low quality of life-----<60% of total
quality of life score

Moderate quality of life -----60-<75
% of total quality of life score

High quality of life -----≥ 75 % of
total quality of life score

Validity:

The study tools were revised for clarity, relevance, comprehensiveness understanding and applicability by a panel of five experts from faculties of nursing to measure the content validity of the tools and the necessary modification will be done accordingly.

Reliability:

Reliability of tools will be done through the use of the Cronbach alpha test to confirm its consistency. It was 0.876 for

knowledge tool, 0.897 for self-reported practice, and 0.923 for quality of life tool

Ethical consideration:

Before the pilot study ethical approval was obtained from the scientific research ethical committee of the faculty of Medicine Beni-Suef University, official permission was taken from the authoritative personnel in the mentioned hospital and written or oral consent was obtained from all mothers, the purpose and the nature of the study was explained to them prior the interview. The investigator emphasized that participation in the study is entirely voluntary; anonymity and confidentiality were assured through coding the data and they have the right to withdraw at any time.

II- Operational design**A- Preparatory phase:**

It included reviewing past, current, national, and international related literature and theoretical knowledge of various aspects of the study using books, articles, the internet, periodicals, and magazines to develop tools for data collection.

B- Pilot study:

A pilot study was conducted on 10% of the mothers of children after cochlear implantation under study to assess the feasibility of the study as well as the clarity and objectivity of the tools. The needed modification was incorporated and those subjects were excluded from the actual study sample.

Fieldwork:

Data was collected from May 2022 to the end of October 2022. After getting ethical and administrative approval, the purpose of the study was explained to all studied mothers, and oral consent was obtained from each mother to participate in the study, the researcher visited the setting of the study 2 days per week, to collect data, data was completed within six months. For the first 3 months' data was collected from the control group, and for the 2nd 3 months' data was collected from the study group. to reduce bias during data collection.

For the control group mothers were instructed according to the hospital instructions after cochlear implantation, the investigator explained the data of the questionnaire to the mothers and needed time to fill this questionnaire was about (30 -45) minutes to complete.

The study was conducted through four phases' assessment, planning, implementation, and

evaluation.

Assessment phase: before starting the designed intervention program, the study tools were applied to assess studied mothers' knowledge and self-reported practice regarding cochlear implantation

NB; the data obtained during this phase from control group participants were considered the basics for the content of the intervention program.

Planning phase: after identifying the needs of patients from the assessment phase, the investigator identifies the needs of the sample and also starts to develop the program items (session times, course outline, course content, prepare the method of teaching and education, design the program, booklet, and prepare the pre and post-test).

Implementation phase:

For the study group: the research provided mothers with essential knowledge, and training them regarding practice to care for their children after cochlear implantation. The investigator explained the same information in each group. The investigator prepared suitable teaching methods (lecture, role play, discussion) and prepared suitable assistance aids (booklet, PowerPoint, posters) especially for each session of the program.

The educational program aimed to improve the knowledge, and practice of mothers with children after cochlear implantation and the quality of life of children after cochlear implantation. Specific objectives: At the end of educational program implementation each mother should be able to: -“ Define hearing loss. - Enumerate risk factors and causes of hearing loss. - Mention signs of hearing loss in infants and children. - Recognize diagnostic tests for hearing loss. - Discuss management of hearing loss. - Explain the prevention of hearing loss. - Define cochlear implantation. - Illustrate the indication and importance of cochlear implantation. - Understand factors associated with good outcomes after cochlear implantation. - Mention the best time for function activation of the cochlear - Explain the methods for cochlear activation. - Illustrate expected risks of cochlear implantation. - Enumerate complications of cochlear implantation. - Discuss health promotion lifestyle after cochlear implantation. - Apply immediate post-operative care after cochlear implantation - Apply wound care after

cochlear implantation surgery. - Demonstrate steps of care for cochlear implants. Implementation Phase The implementation phase was completed in four sessions (2 sessions for theoretical learning and 2 sessions for practical learning). During the session mothers and their children sat together with the researchers in a suitable organized place, mothers had an opportunity to ask questions and share information. The duration of each theoretical and practical session ranged from 45-60 minutes for three days/week. At the beginning of each session, the researchers started with a summary of the previous session and the objectives of the new one, taking into consideration using the Arabic language to suit mothers' educational level.

An educational program (knowledge and practice education program) was applied and carried out. With use the booklet.

Program evaluation: after implementation of the program, the researcher evaluated the level of improvement in mothers' knowledge and self-reported practice and quality of life among studied children.

Administrative design:

Approval to carry out this study was obtained from the Dean of the Faculty of Nursing, Beni-Suef University, and official permission was obtained from the director of the ENT outpatient clinics at Beni-Suef University Hospital about mother's children with cochlear implantation in Beni-Suef city for conducting the study.

Statistical Analysis

The statistical analysis of data was done by using the computer software Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies and percentages for categorical data, and the arithmetic mean and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi-square test (X^2). Differences between the groups during the two visits were assessed by paired t-test. In addition, R- R-R-tests were used to identify the correlation between the study variables and measure the statistical significance of the study.

Significance of the results: -

- * Statistically significant $p < 0.05$
- * Highly statistically significant $p < 0.001$
- * Not significant $P > 0.05$

Results

Table (1): indicated that 53.8 %, and 41.2% of the studied in both control and study respectively had age groups from 2-<30 years old with a mean of 31.56 ± 7.84 and 31.76 ± 8.42 among the study and control group respectively. Also, 65.0% and 48.8% of the studied mothers in control and study respectively were married, furthermore 66.2, and 88.8% of mothers in control and study respectively lived in rural settings, and 36.2% and 52.5% of mothers in control and study respectively had a secondary level of education. Moreover, 65.0% & 76.2% of mothers in the control and study respectively were housewives. In addition, there was no significant difference between the control and study groups' mothers regarding their age, marital status, educational level, residence, and occupation $p (>0.05)$, which reveals homogeneity among the studied groups.

Table (2): indicated that 63.8% of mothers in the control group had a family income not enough, while 53.8% of mothers in the study group added that the family income was enough. Moreover, 50.0% & 56.3% of the studied mothers in control and study groups had four members in their family. In addition, that there was no significant difference between the studied and control groups' mothers regarding their family history including number of rooms, family income, and number of family members ($p > 0.05$).

Table (3): indicated that 57.5% & 57.5% of studied children in the control and study groups respectively age was ranged from 1 to less than 3 years old with mean of 3.32 ± 0.967 and 3.68 ± 0.852 for both control and study groups respectively .furthermore 63.8% & 71.2% of the children were female in control and study group respectively, 57.4% and 42.5% of the children were the second child among family children in control and study group respectively. Moreover, there was no significant difference between the study and control groups' children's demographic characteristics including their age, gender, site of birth, and their ranking among brothers ($p > 0.05$).

Table (4): indicated that there was a highly significant difference between the knowledge of the studied mothers in both control

and study groups as the mothers in the study group had higher mean scores in all studied knowledge items including anatomy of the eye, where the cochlear located, What is a cochlear implant process, What are the specifications of people who are qualified for cochlear implants at is the ideal age for cochlear implants, Who are the people who undergo a cochlear implant, What are the specifications of people who are qualified for cochlear implants, advantages of cochlear implementation, benefits of cochlear implants, the side effects of cochlear implants, the complications of cochlear implantation for some cases, the effect of MRI on cochlear implants, the results of cochlear implantation depend on, How long does a cochlear implant take, and How can the results of the operation be better utilized, than mothers at the control groups (p -value $< 0.001^{**}$).

Figure 1 illustrates that 68.8% of the control group had a poor level of knowledge as compared with 3.8% of the study group. On the other hand, 87.5% of the study group had a good level of knowledge as compared with 12.5% of the control group.

Table (5): indicated that the self-reported practice regarding caring for the children after cochlear implementation surgery including their practice concerning feeding, nutrition, hygiene, speaking, communication, and education were implemented highly by the mothers in the study group, as compared with mothers at the control group P value ($< 0.001^{**}$).

Figure 2: illustrates that 48.8% of mothers in the control group had unsatisfactory reported practice, as compared with 11.2% of the mothers in the study group, While 88.8% of the mothers in the study group had a satisfactory practice as compared with 51.2% of mothers at control group.

Table (17): indicated that children in the study group had higher quality of life sub domains mean score than children in the control group. In addition, there was a highly significant difference regarding the different quality of life domain mean scores between the study and control groups. P value ($< 0.001^{**}$).

Figure 3: illustrates that 75.0% of mothers in the control group reported that their children had a low quality of life score, as compared with 2.5 % of the mothers in the study group, who reported that their children had a low

quality of life score. on the other hand, 85.0% of mothers in the study group reported that their children had a high quality of life as compared with 10.0 % of children in the control group.

Table (18): indicated that there was a significant and a highly significant positive association between studied mothers' knowledge and self-reported practice and their children's

quality of life score respectively among study group mothers, while there was only a positive association between studied mothers knowledge and self-reported practice and their children quality of life score among control group mother and their children quality of life.

Table (1): Distribution of the demographic characteristics of the studied mothers in different groups (n= 160).

| Demographic characteristics | Control group | | Study group | | Chi-square | P value |
|----------------------------------|---------------|------|-------------|------|------------|---------|
| | No | % | No | % | | |
| Age in years | | | | | | |
| 20-<30 | 43 | 53.8 | 33 | 41.2 | 2.72 | >0.05 |
| 30-<40 | 20 | 25.0 | 23 | 28.8 | | |
| 40-50 | 17 | 21.2 | 24 | 30.0 | | |
| Mean ±SD | 31.56±7.84 | | 31.76±8.42 | | | |
| Relative parents | | | | | | |
| No | 38 | 47.4 | 37 | 46.2 | 4.89 | >0.05 |
| 1 st -degree relation | 31 | 38.8 | 23 | 28.8 | | |
| 2 nd -degree relation | 11 | 13.8 | 20 | 25.0 | | |
| Marital status | | | | | | |
| Married | 52 | 65.0 | 39 | 48.8 | 4.32 | >0.05 |
| Divorced | 18 | 22.5 | 26 | 32.4 | | |
| Widow | 10 | 12.5 | 15 | 18.8 | | |
| Setting | | | | | | |
| Urban | 53 | 66.2 | 71 | 88.8 | 0.229 | >0.05 |
| Rural | 27 | 33.8 | 9 | 11.2 | | |
| Educational level | | | | | | |
| Illiterate | 2 | 2.5 | 2 | 2.5 | 4.59 | >0.05 |
| Basic | 23 | 28.8 | 15 | 18.8 | | |
| Secondary | 29 | 36.2 | 42 | 52.5 | | |
| University | 26 | 32.5 | 21 | 26.2 | | |
| Occupation | | | | | | |
| Working | 28 | 35.0 | 19 | 23.8 | 2.44 | >0.05 |
| Housewife | 52 | 65.0 | 61 | 76.2 | | |

Table (2): Distribution of the family history and home environment of the studied mothers in different groups (n= 160).

| Family history | Control group | | Study group | | Chi-square | P value |
|----------------------------------------------|---------------|------|-------------|------|------------|---------|
| | No | % | No | % | | |
| The number of rooms in the house | | | | | | |
| One | 7 | 8.8 | 6 | 7.4 | 1.93 | >0.05 |
| Two | 20 | 25.0 | 28 | 35.0 | | |
| Three | 50 | 62.4 | 43 | 53.8 | | |
| Four rooms or more | 3 | 3.8 | 3 | 3.8 | | |
| Family income from your point of view | | | | | | |
| Not enough | 51 | 63.8 | 31 | 38.8 | 5.60 | >0.05 |
| Enough | 18 | 22.5 | 43 | 53.8 | | |
| Enough and save | 11 | 13.8 | 6 | 7.4 | | |
| Number of family members | | | | | | |
| 3 members | 15 | 18.8 | 17 | 21.3 | 1.55 | >0.05 |
| 4 members | 40 | 50.0 | 45 | 56.3 | | |
| 5 members | 25 | 31.2 | 18 | 22.5 | | |

Table (3): Distribution of the child personnel characteristics of the studied mothers in different groups (n= 160).

| Demographic characteristics | Control group | | Study group | | Chi-square | P value |
|-------------------------------|---------------|------|-------------|------|------------|---------|
| | No | % | No | % | | |
| Age in years | | | | | | |
| Less than one year | 6 | 7.5 | 8 | 10.0 | 1.02 | >0.05 |
| 1-<3 years | 46 | 57.5 | 36 | 45.0 | | |
| 3-5 years | 28 | 35.0 | 36 | 45.0 | | |
| Mean ±SD | 3.32±0.967 | | 3.68±0.852 | | | |
| Gender | | | | | | |
| Male | 29 | 36.2 | 23 | 28.8 | 3.75 | >0.05 |
| Female | 51 | 63.8 | 57 | 71.2 | | |
| Site of birth | | | | | | |
| Home | 11 | 13.8 | 13 | 16.3 | 0.247 | >0.05 |
| Governmental hospital | 46 | 57.4 | 34 | 42.5 | | |
| Private hospital | 23 | 28.8 | 33 | 41.2 | | |
| Ranking among brothers | | | | | | |
| First | 25 | 31.2 | 24 | 30.0 | 4.30 | >0.05 |
| Second | 39 | 48.8 | 29 | 36.2 | | |
| Third or more | 16 | 20.0 | 27 | 33.8 | | |
| Feeding type | | | | | | |
| Breastfeeding | 64 | 80.0 | 49 | 61.3 | 16.10 | <0.05* |
| Bottle feeding | 0 | 0.0 | 15 | 18.8 | | |
| Oral normal meals | 16 | 20.0 | 16 | 20.0 | | |

*statistical significant

Table (4): Comparison of the knowledge mean score between the studied mothers in different groups (n= 160).

| Knowledge | Control group | Study group | Paired t-test | P value |
|-------------------------------------------------------------------------------|----------------|----------------|---------------|---------|
| | Mean ±SD | Mean ±SD | | |
| What is the structure of the ear? | 2.0750±1.25057 | 2.8125±.45266 | -5.075 | <.001** |
| Where is the cochlea located | 1.4000±1.03850 | 2.0875±.73250 | -5.006 | <.001** |
| What is a cochlear implant process | 1.3500±.79715 | 1.7750±.81092 | -3.171 | <.001** |
| What is the ideal age for cochlear implants | .9125±.62020 | 1.4875±.77938 | -5.001 | <.001** |
| Who are the people who undergo a cochlear implant | 1.1625±1.20593 | 2.3625±.86043 | -7.769 | <.001** |
| What are the specifications of people who are qualified for cochlear implants | 1.1250±1.24651 | 2.3500±.94266 | -6.566 | <.001** |
| What are the advantages of cochlear implantation? | 1.2250±1.21150 | 1.9000±1.19704 | -3.453 | <.001** |
| What are the benefits of cochlear implants? | 1.1625±1.21638 | 1.7500±1.10808 | -3.228 | <.001** |
| What are the side effects of cochlear implants? | 1.1375±1.34770 | 2.1875±1.23343 | -5.281 | <.001** |
| What are the complications of cochlear implantation in some cases? | 1.1750±1.33857 | 1.9000±1.35572 | -3.385 | <.001** |
| What is the effect of MRI on cochlear implants? | .9000±1.12058 | 1.6750±1.16679 | -4.335 | <.001** |
| What do the results of cochlear implantation depend on? | 1.0250±1.11350 | 1.7250±1.23222 | -3.889 | <.001** |
| How long does a cochlear implant take? | .9625±1.09595 | 1.9125±.74958 | -6.734 | <.001** |
| How can the results of the operation be better utilized? | 1.1625±1.31634 | 1.6625±1.16862 | -2.621 | <.0.05* |

*statistical significant

**highly statistical significant

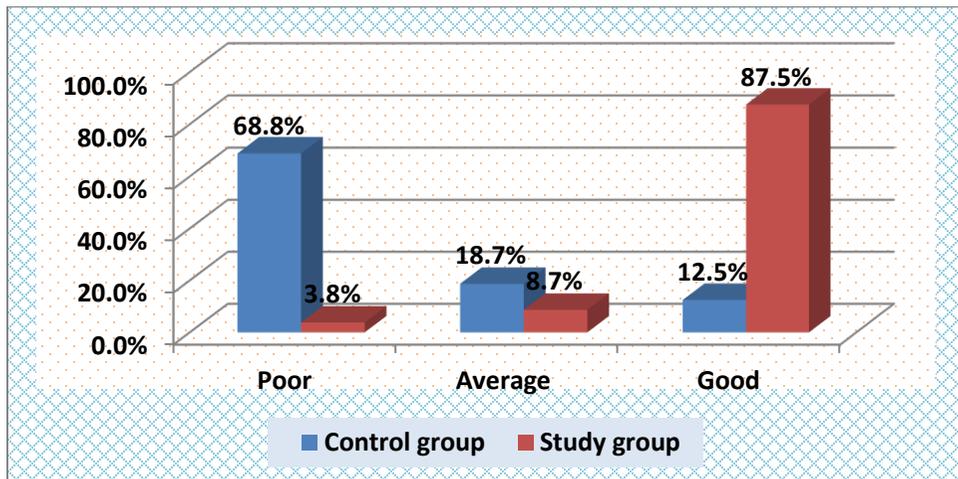


Figure (1): percentage distribution of total knowledge level of the women in both control and study groups.

Table (5): Distribution of studied mothers' practice regarding care of children under Cochlear Implantation surgery in different groups (n= 160).

| Practice | Control group | | | | Study group | | | | Chi-square test | P value |
|---------------------------------------------------------------------------------------------------------------------------|---------------|-------|----------|-------|-------------|--------|----------|-------|-----------------|----------|
| | Done | | Not done | | Done | | Not done | | | |
| | No | % | No | % | No | % | No | % | | |
| 1- Ensure that the child is fed integrated meals that contain fresh vegetables and fruits to strengthen his immune system | 44 | 55.0% | 36 | 45.0% | 67 | 83.8% | 13 | 16.3% | 15.56 | <0.001** |
| 2- Avoid feeding the child foods that contain preservatives | 24 | 30.0% | 56 | 70.0% | 66 | 82.5% | 14 | 17.5% | 44.80 | <0.001** |
| 3- Avoid being with the child in crowded and unclean places | 35 | 43.8% | 45 | 56.3% | 67 | 83.8% | 13 | 16.3% | 27.69 | <0.001** |
| 4- Avoid dealing with the child with infected people | 42 | 52.5% | 38 | 47.5% | 63 | 78.8% | 17 | 21.3% | 12.21 | <0.001** |
| 5- Keep the slide location dry and clean | 62 | 77.5% | 18 | 22.5% | 80 | 100.0% | 0 | 0.0% | 20.28 | <0.001** |
| 6- Give the child a chance to speak | 42 | 52.5% | 38 | 47.5% | 66 | 82.5% | 14 | 17.5% | 16.41 | <0.001** |
| 7- I repeat the words for my child to facilitate understanding | 42 | 52.5% | 38 | 47.5% | 80 | 100.0% | 0 | 0.0% | 49.36 | <0.001** |
| 8- Look at my child intently while talking Wait for my child to answer after asking questions | 32 | 40.0% | 48 | 60.0% | 62 | 77.5% | 18 | 22.5% | 23.21 | <0.001** |
| 9- I speak to my child in a normal voice | 47 | 58.8% | 33 | 41.3% | 77 | 96.3% | 3 | 3.8% | 23.25 | <0.001** |
| 10- I provide my child with a quiet, noise-free environment | 33 | 41.3% | 47 | 58.8% | 63 | 78.8% | 17 | 21.3% | 23.45 | <0.001** |
| 11- Get him involved in social life | 55 | 68.8% | 25 | 31.3% | 80 | 100.0% | 0 | 0.0% | 29.63 | <0.001** |
| 12- I make sure that the cochlear apparatus is intact and working efficiently | 46 | 57.5% | 34 | 42.5% | 68 | 85.0% | 12 | 15.0% | 14.76 | <0.001** |
| 13- I make sure that the child wears the device throughout the day, except for sleeping and bathing time | 35 | 43.8% | 45 | 56.3% | 69 | 86.3% | 11 | 13.8% | 31.75 | <0.001** |
| 14- Avoid having anything in the mouth while talking to the child | 30 | 37.5% | 50 | 62.5% | 69 | 86.3% | 11 | 13.8% | 40.29 | <0.001** |
| 15- I try to keep smiling while talking to the child | 32 | 40.0% | 48 | 60.0% | 64 | 80.0% | 16 | 20.0% | 26.66 | <0.001** |
| 16- I try to use a clean and clear voice | 31 | 38.8% | 49 | 61.3% | 80 | 100.0% | 0 | 0.0% | 70.63 | <0.001** |
| 17- I try to use pictures and act out the sounds of things | 36 | 45.0% | 44 | 55.0% | 68 | 85.0% | 12 | 15.0% | 28.13 | <0.001** |
| 18- Use well-known phrases such as good morning, good evening and others | 43 | 53.8% | 37 | 46.3% | 72 | 90.0% | 8 | 10.0% | 26.00 | <0.001** |
| 19- I always try to train the child to speak and not focus on testing his ability to speak | 43 | 53.8% | 37 | 46.3% | 79 | 98.8% | 1 | 1.3% | 44.72 | <0.001** |
| 20- I follow up continuously with the speech therapist and stick to the appointments of the sessions | 38 | 47.5% | 42 | 52.5% | 71 | 88.8% | 9 | 11.3% | 31.34 | <0.001** |
| 21- Have the child participate continuously in educational and social opportunities for verbal communication | 48 | 60.0% | 32 | 40.0% | 78 | 97.5% | 2 | 2.5% | 33.61 | <0.001** |
| 22- Make him constantly exposed to environmental stimuli, for example, car sounds, ringing phones, doorbells, etc | 39 | 48.8% | 41 | 51.3% | 67 | 83.8% | 13 | 16.3% | 21.91 | <0.001** |
| 23- Training the child to detect the sound "the presence of sound - the absence of sound" | 52 | 65.0% | 28 | 35.0% | 74 | 92.5% | 6 | 7.5% | 18.07 | <0.001** |
| 24- Training the child to distinguish between sounds | 43 | 53.8% | 37 | 46.3% | 67 | 83.8% | 13 | 16.3% | 16.75 | <0.001** |

*statistical significant

**highly statistical significant

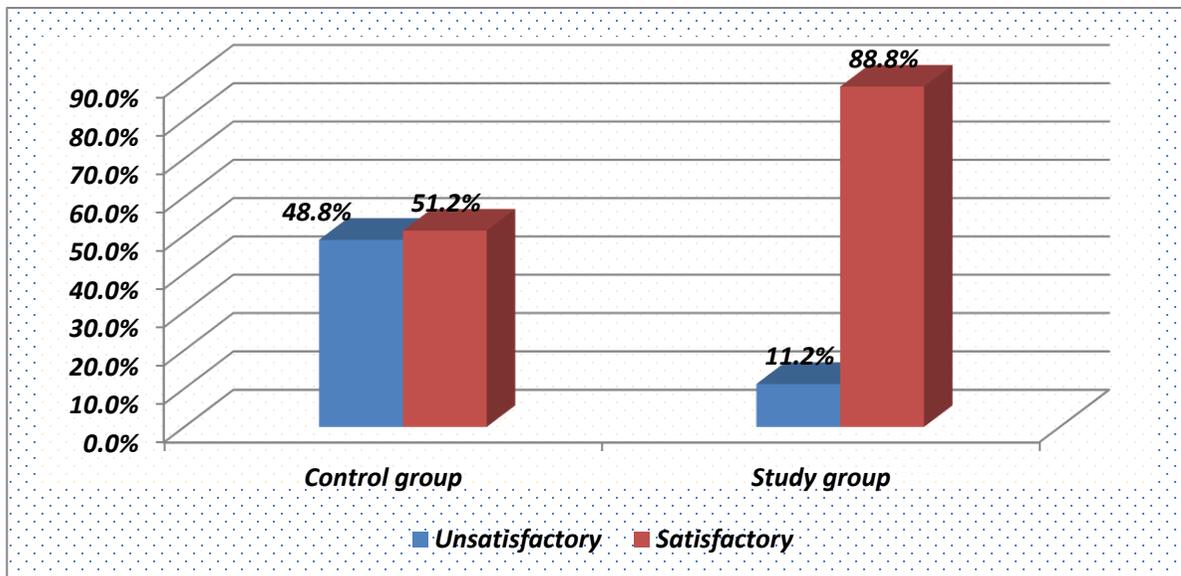


Figure (2): Percentage distribution of total practice level among the studied women in both control and study groups.

Table (17): Comparison of quality of life domains mean score between the studied mothers in different groups (n= 160).

| Quality of life domains | Control group | Study group | Paired t-test | P value |
|--------------------------------|-------------------|-------------------|---------------|---------|
| | Mean ±SD | Mean ±SD | | |
| Pre-operative conditions | 16.5250±9.23940 | 23.5625±4.80992 | 6.04 | <.001** |
| Process | 17.2875±.01503 | 26.2750±2.23876 | 8.65 | <.001** |
| positive effects of the device | 8.6750±3.16538 | 20.2250±.99333 | 31.13 | <.001** |
| Support | 9.3375±3.68350 | 17.6375±2.29608 | 17.10 | <.001** |
| Communication | 7.5375±3.57539 | 17.3750±3.50542 | 17.57 | <.001** |
| Self-confidence | 7.5125±2.09879 | 20.7125±3.33828 | 29.94 | <.001** |
| Happiness & recover | 4.7000±1.47897 | 11.3500±1.54346 | 27.82 | <.001** |
| Social relationship | 10.5250±2.19306 | 24.2875±3.68436 | 28.70 | <.001** |
| Education | 5.6125±2.34652 | 13.7625±1.69320 | 25.19 | <.001** |
| Cochlear Implantation Team | 7.9000±2.94507 | 22.0125±1.79658 | 36.58 | <.001** |
| In general | 6.9625±2.54302 | 14.3250±2.16868 | 19.70 | <.001** |
| Total quality of life | 102.5750±31.85480 | 211.5250±11.79356 | 28,68 | <.001** |

*statistical significant

**highly statistical significant

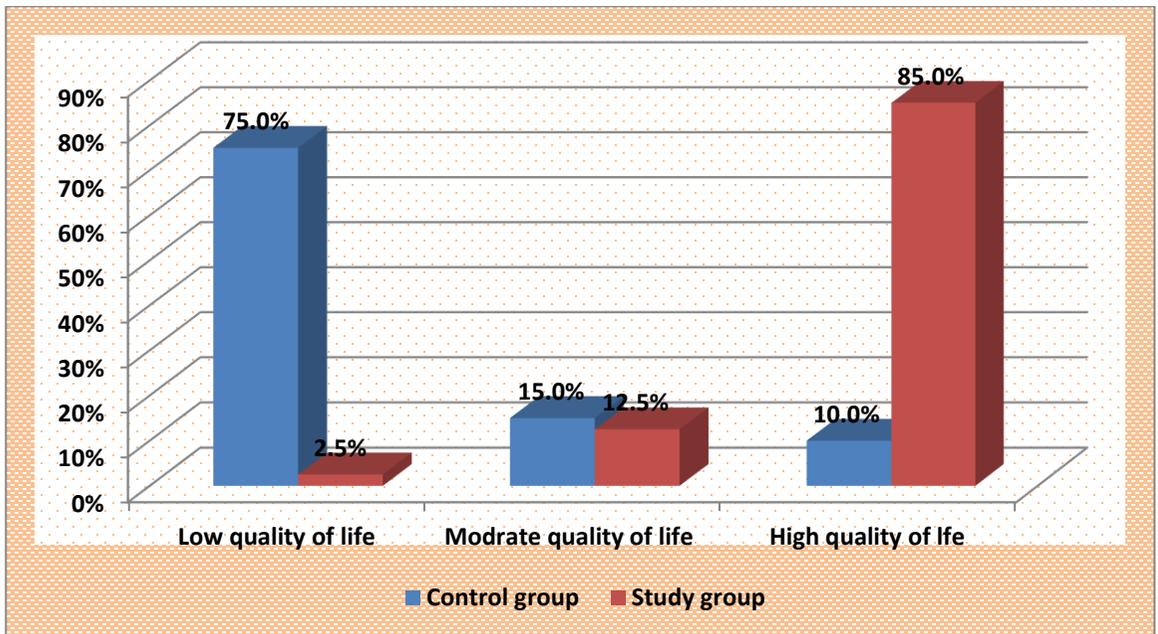


Figure (3): percentage distribution of total quality of life scores of the studied children in both control and study groups.

Table (18): correlation between study and control groups' knowledge, practice, and reported children's quality of life.

| Variables | Children reported quality of life | | | |
|---------------------------|-----------------------------------|---------|-------------|----------|
| | Control group | | Study group | |
| | r | P value | r | P value |
| Knowledge | 0.025 | >0.05 | 0.356 | <0.05* |
| Mothers reported practice | 0.158 | >0.05 | 0.569 | <0.001** |

Discussion

Hearing impairment is one of the most common disabilities and has lifelong consequences for affected children and their families. Parents of hearing-impaired children usually feel depressed and unqualified to manage their children beneficially and efficiently. This doubt in their abilities is often exhibited as affliction. Nurses and specialists should preserve the level of parental involvement, quality, quantity, and timing of care services that children receive is essential to their psychosocial, and academic development and ultimately the quality of life they achieve (*Zhang et al., 2020*).

The cochlear implant (CI) surgery impact on children with severe and/or profound hearing loss extends beyond the improvement in hearing and language skills and speech production and perception.

This impact also involves other aspects of the child's daily life, such as physical, psychological, and social well-being (*Gordon et al., 2022*). The current study is a quasi-experimental study that aims to improve the quality of life among children after cochlear implants. The current study findings supported the study hypothesis, first hypothesis that with quality of life for children will be improved after the implementation of the health education program. These findings may be due to the improved knowledge and practice of the studied mothers enabled them to understand well their children's needs and support and assess them to provide care for them based on a scientific base. These findings agreed with (*Moradi, 2022*), in Iran, in the study to assess the Rehabilitation of children with cochlear implants, it was stated that

the rehabilitation process in children after cochlear

implant surgery will be incomplete without the presence and support of the family.

Also, The researchers of the present study viewed that, knowing the nature of the disease reduces the anxiety and abnormal behavior of parents, especially mothers and 2870 providing the parents with education and appropriate information helps them to feel have more control and power in different situations as parental education is an essential tool that reduces the fear of unknowns and can reduce anxiety and improve parental and ill children outcomes

Also, the present study findings supported the second hypothesis that related knowledge of mothers will be improved after the implementation of the health education program, as 68.8% of the control group had a poor level of knowledge as compared with 12.5% of the study group. On the other hand, 87.5% of the study group had a good level of knowledge as compared with 3.8% of the control group. This may be due to that educational intervention improves knowledge among mothers in the study group. on the other hand, mothers in the control group had ordinary care for their children. Moreover, the present study findings supported the third study hypothesis that care provided to children improves after the implementation of the health education program.

Regarding the personnel characteristics among the studied children, the result of the current study revealed that there was no significant difference between the study and control groups children's demographic characteristics including their age, gender, site of birth, and their ranking among brothers, which reveals that homogeneity among studied groups. These findings are in the same line with (*Warner-Czyz et al., 2022*) at Texas University, in a study to assess "Parent-reported quality of life in children with cochlear implants differs across countries. *Frontiers in Psychology*" who reported that there was no statistically significant difference between studied children in different studied groups. Moreover, (*Alnuhayer et al., 2020*), in Saudi Arabia, in a study to evaluate the effect of cochlear implants and quality of life ", it was revealed that there was no statistically

significant difference regarding personnel characteristics of the studied children. On the other hand, the present study findings disagreed with those who added that there was a difference among the studies investigated, considering the age upon evaluation, age of surgery, CI use duration, and the instruments used to assess quality of life.

Concerning the family history of the studied children the present study findings revealed that there was no significant difference between the studied and control groups including number of rooms, family income, and number of family members. These findings support that the children in both the study and control groups had the same social and family history. These findings are agreed with (*Zhumabayev et al., 2022*), in Kazakhstan in the study to evaluate Quality of life in children with cochlear implants.

As regards the personnel characteristics of the studied mothers, the present study revealed that there was no statistically significant difference between the studied and control groups mothers regarding their age, marital status, educational level, residence, and occupation $p (>0.05)$, that reveals that homogeneity among studied groups. The mean age of the studied mothers was 31.64 ± 7.69 , these findings agreed with (*Muller, 2023*), in the study to evaluate outcomes for educational placement and quality of life in a prospectively recruited multinational cohort of children with cochlear implants" it was reported that there was no statistical difference regarding studied caregiver personnel characteristics.

Moreover (*Tork et al., 2022*), added that the mean age of the studied parents was 31.47 ± 4.13 years. in addition (*Hashemi et al., 2019*) carried out a study about "The effect of education on anxiety and self-efficacy in mothers of 1-3-year-old children under cochlear implant surgery: a randomized controlled clinical trial" and found that, slightly more than three quarters (77%) of the studied mothers in the age group of 25 to >30 years, exactly half (50%) of them had a diploma, most (81.4%) of the studied mothers were housewives.

Improving parental knowledge can increase their self-efficacy and competence. Nurses, as an important member of the health team, should be able to understand the emotional and psychological responses of the parents as well

as create a good educational environment and convey necessary interest and support related to cochlear implantation surgery and its outcomes for the parents so that, the parents can better adapt to the created condition and gain a better understanding from their new role in that new position (Zare, et al., 2019). Educational intervention usually helps in developing knowledge for the participants. The present study findings revealed that the vast majority of mothers in the study group had better knowledge than those in the control group. These findings are by (Aylward et al., 2022), who added that educational intervention improves knowledge among the studied caregivers.

Concerning the level of knowledge among mothers in the control study group the present study findings showed that the majority of mothers had a poor level of knowledge, and this may be due to that the ordinary care provided by the cochlear implant surgery team doesn't give high attention for educational intervention for caregivers that caring for children. These findings are agreed with (Suskind et al., 2019) about "Spoken language intervention curriculum for parents of low-socioeconomic status and their deaf and hard-of-hearing children ". Their results showed a positive impact of the program on parental knowledge for the majority (89%) of participants concerning children's language development and on the quality of the parents' linguistic exchanges with their children post-training program. Furthermore, 3 months after the end of the training program, the improvements in parental information regarding the quality of communication interactions with their children. Moreover, (Tork et al., 2022), pointed out that there was a highly statistically significant difference between the level of knowledge of the studied parent after the implementation of the educational program regarding the care of children after cochlear implementation surgery.

As viewed in the current study it was indicated that there was a high statistical significance improvement of studied mothers' reported practice in the study group regarding caring for their children after cochlear implantation surgery. These findings are in the same line with (Wright et al., 2021), at York University the study to assessed a systematic scoping review of early interventions for parents of deaf infants, and confirmed that training program was effective as a method to increasing

parental total practice and communication-enhancing behaviors and reduce communication-inhibiting behaviors in PT parents. Also, (Nadzet al., 2021) in the study entitled "Parent Training and Communication Empowerment of Children with Cochlear Implant" stated that, before the educational program, there were no differences between the CI-children of the PT group and the control group. At the end of the group sessions, CI children whose parents attended the training showed a larger increase in word and sentence comprehension and word production, with significantly better performance of parents regarding the care of their children than the control group. Furthermore, (Tork et al., 2022), in Egypt in a study to assess the effect of empowerment programs on parents' self-competence regarding the care of their children with cochlear implantation pointed out that there was a highly statistically significant improvement in parents' reported practice regarding care of their children after cochlear implantation post empowerment program implementation.

The present study findings demonstrated that there was a highly statistically significant association between studied mother knowledge, practice, and the total quality of life of their children among mothers in the study group. These findings may be related to that improved knowledge and practice positively affected the quality of life of studied children. These findings are agreed with (Tork et al., 2022), who illustrated that there was a highly statistically significant association between studied parents' knowledge and practice.

Conclusion

Based on the results of the present study, it was concluded that there was a highly statistically significant difference between the study and control group regarding the knowledge, self-reported practice, and quality of life of the studied children ($p < 0.001$), and there was an improvement in of the studied children quality of life after cochlear implant surgery in the study group, that may be due to the improvement of studied mothers' knowledge and reported practice regarding care of their children with cochlear implantation.

Recommendations

In the light of the findings of the current study,

the following recommendations are suggested:

- Developing a health education program for mothers with children after cochlear implantation surgery is highly recommended.
- Provide continuous updated educational programs for mothers regarding the care of children with cochlear implantation.
- Written instructions about cochlear implantation in the form of booklets or brochures should be provided to each child with hearing impairment and their mothers to ensure effective loyalty to the plan of care.
- Regular screening especially for children with a family history of hearing impairment for early detection as well as prevent serious consequences.
- Consistent training of parents on the support and communication skills with their hearing-impaired children with cochlear devices.
- Further research is highly recommended to evaluate the effect of nursing role in helping mother for their children after cochlear implantation surgery.

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