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Original Article

Satisfaction with Life among Mothers of Pediatric Cochlear Implant Candidates: The Impact of Implant Operation and Sociodemographic Factors

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OBJECTIVES: To evaluate the satisfaction with life among mothers of pediatric cochlear implant candidates regarding implant surgery and sociodemographic factors.

MATERIALS and METHODS: Mothers of 160 pediatric patients with profound sensorineural hearing loss who underwent unilateral cochlear implant surgery were included. A questionnaire form with items on sociodemographic-familial characteristics and Satisfaction with Life Scale (SWLS) was employed via face-to-face interview method before and 12 months after the implant surgery.

RESULTS: The SWLS scores significantly improved after the implant surgery [from 19.1 (7.0) to 28.9 (4.0), $p<0.000$]. Being unemployed vs. employed [17.9 (6.9) vs. 24.0 (5.3), $p=0.000$], having another child with hearing disability [13.5 (5.7) vs. 19.7 (6.9), $p=0.001$], younger (12–24 months) vs. older (>24 months) age of the child at the time of implant surgery [7.1 (0.4) vs. 19.7 (6.6), $p=0.001$], absence vs. presence of regular follow-up visits [13.0 (0.0) vs. 19.4 (7.1), $p=0.002$], and presence vs. absence of change in social life after the diagnosis of disease [17.3 (6.5) vs. 20.9 (7.1), $p=0.001$] were associated with significantly lower SWLS scores among mothers. SWLS scores were positively correlated with patient's age at the time of implant surgery ($r=0.206$, $p=0.009$), whereas negatively correlated with the number of household members ($r=-0.406$, $p=0.000$) and number of children ($r=-0.310$, $p=0.000$).

CONCLUSION: In conclusion, our findings revealed the association of cochlear implantation with a significant increase in mother's life satisfaction, despite the unemployment, presence of another child with hearing disability, and crowded household. Our findings emphasize on the consideration of family systems with special attention to mother's emotional experiences and occupational competence in the intervention programs.

KEYWORDS: Pediatric sensorineural hearing loss, cochlear implant, maternal life satisfaction, occupation, emotional experience

INTRODUCTION

Cochlear implants have become the standard of care in the management of children with severe to profound sensorineural hearing loss [1]. Along with improved technical performance of the device in providing hearing sensitivity within the speech, there has been an expanded patient candidacy and progressive reduction in the minimum age for implantation over the years [1].

Cochlear implantation has been associated with improved hearing as well as speech and language skills and better academic performance in implanted children [1]. However, the parental involvement and consideration of family perspective in the management of the disease are considered crucial in the follow-up and attainment of desirable language and reading skills among cochlear implanted children [2-5].

Early childhood hearing loss has been associated with unique and long-term challenges for parents in terms of communication difficulties, medical care, and academic problems [6, 7]. Thus, parenting a child with hearing disability is accompanied with increased stress levels among both parents, where mothers are considered to be particularly prone to increased stress due to high level of responsibility in attending appointments, managing hearing devices, and provision of home care and therefore

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considered to develop different ways of coping strategies as compared to fathers [2, 8-10].

Parental involvement and consideration of family perspective in rehabilitation and family-oriented interventions are of utmost importance in the management of cochlear implanted children [8, 11]. However, majority of past studies among cochlear implanted children have concentrated on the efficacy of the procedure in terms of speech perception and production with limited data on the outcomes from the broader perspectives, including the role of family, the effect of hearing loss on the family, and the needs and perspectives of parents during rehabilitation [11-13].

This study was therefore designed to evaluate satisfaction with life among mothers of pediatric cochlear implant candidates regarding implant surgery and sociodemographic factors.

MATERIAL and METHODS

Study Population

Mothers of 210 pediatric patients with profound sensorineural hearing loss who underwent unilateral cochlear implant surgery between 2010-2014 years in a tertiary care clinic were initially enrolled in this study. Patients aged >18 years with co-morbid disabilities, parental hearing loss, parental divorce, or non-parent custody were excluded from the study. Accordingly, due to exclusion of 50 patients or mothers that met the exclusion criteria, the final study population comprised 160 mothers [mean (standard deviation, SD) age: 29.5 (5.5) years].

Assessments

A questionnaire form with items on sociodemographic-familial characteristics and Satisfaction with Life Scale (SWLS) was employed via face-to-face interview method for each mother before the implant surgery. SWLS was applied once again to each mother 12 month after the cochlear implant surgery.

Sociodemographic Questionnaire Form

Sociodemographic questionnaire form included items on maternal characteristics (age, educational status, and occupation), familial characteristics (number of household members, income level, health insurance, number of children, other children with hearing loss, and consanguineous marriage), patient characteristics (age, sex, age at cochlear implant implementation, duration of hearing device prior to cochlear implant, and number of annual hospital visits) and burden of the disease, including overall impact (occupational problems, physical tiredness, need for support, treatment cost, transport problems, and problems with care of other children), and specific impacts on family life (interpersonal relations, individual responsibilities, and stress), social life (change in social environment, vacations, entertainment activities, and relations with friends), and emotional life (loneliness, panic, guilt, fear, and inhibition of negative feelings).

Satisfaction with Life Scale

Satisfaction with Life Scale (SWLS) is a short 5-item instrument developed by Diener et al. [14] in 1985 as a tool for the measurement of the life satisfaction component of subjective well-being. It is based on a 7-point Likert style response scale (1: strongly disagree to 7: strongly agree) with the items summed to provide a final score ranging from 5 (minimum life satisfaction) to 35 (maximum life satisfaction). Adaptation and validation of the Turkish version of the SWLS was performed by Durak et al. [15] in 2010.

Statistical Analysis

Statistical analysis was performed using The Statistical Package for the Social Sciences for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). Numerical data were analyzed using the Mann–Whitney *U*-test, whereas change over time was evaluated using the Wilcoxon test. Correlation analysis was performed via Spearman correlation analysis. Data were expressed as "mean (SD)," minimum-maximum, and percentage (%) where appropriate. $p<0.05$ was considered statistically significant.

RESULTS

Maternal, family, and patient characteristics:

The mean age of the mothers in this study population was 29.5±5.5 years. Most of them were primary school graduates (59.0%) and unemployed (80.0%) with low levels of monthly income (85%) (Table 1).

The mean number of overall family members and children within families were 4.2 and 1.6 respectively, whereas consanguineous marriage and another child with hearing loss were present in 25.0% and 10.0% of families, respectively (Table 1).

The mean age of the pediatric patients was 5.8±2.2 (range, 3–13) years; 70% were girls, and 70% were diagnosed with hearing loss before 12 months of age (40% at 0–6 months of age) and 70% were using the hearing device before 24 months of age. The age at implant surgery was 36–48 months in 50.0%, 24–36 months in 25.0%, and 48–60 months in 20.0% of patients, whereas only 5% of patients were younger than 24 months (Table 1). All patients had unilateral cochlear implants along with a contralateral hearing aid.

Regular follow-up was evident in majority of patients (95%) based on visits (5–7 times) per year (60.0%) (Table 1).

Burden of the disease:

The most significant burden of the disease was the treatment cost (30.0%), followed by work-related problems (25.0%) and problems with the care of other children (15.0%) (Table 2).

Considering the impact of disease on family life, 70.0% of the mothers identified an increase in either individual responsibilities or stress in the family, whereas 30.0% indicated improved interpersonal relations and connection in the family after the diagnosis of disease (Table 2).

Change in social life after the diagnosis of the disease was evident in 50.0% of the mothers, including new social environment (100.0%) with a change in entertainment activities (60.0%), relations with friends (30.0%), and vacation routine (10.0%) (Table 2).

The most predominant emotions experienced by the mothers were loneliness (44.0%), inhibition of negative affection (20.0%), and guilt (19.0%), followed by fear (15.0%) (Table 2).

Table 1. Maternal, family and patient characteristics

Maternal characteristics		
Age (year)	Mean (SD)	29.5 (5.5)
	Median (min-max)	28.0 (23-45)
Educational status		
Illiterate		18 (11.0)
Primary School		94 (59.0)
Secondary School		48 (30.0)
Occupational status		
Employed		32 (20.0)
Unemployed		128 (80.0)
Monthly income		
0-1000 TL		102 (64.0)
1000-1500 TL		34 (21.0)
1500-2000 TL		16 (10.0)
>2000 TL		8 (5.0)
Health insurance		
Yes		152 (95.0)
No		8 (5.0)
Family characteristics		
# of household members, mean(SD; min-max)		4.2 (1.6; 2-9)
# of children, mean(SD; min-max)		1.6 (0.8;1-4)
Another child with hearing loss		
Yes		16 (10.0)
No		144 (90.0)
Consanguineous marriage		
Yes		40 (25.0)
No		120 (75.0)
Patient characteristics		
Age (year)	mean(SD)	5.8 (2.2)
	median(min-max)	5.5 (3-13)
Gender, n(%)		
Girl		112 (70.0)
Boy		48 (30.0)
Age at diagnosis of hearing loss		
0-6 month		64 (40.0)
6-12 month		48 (30.0)
12-18 month		24 (15.0)
18-24 month		8 (5.0)
>24 month		16 (10.0)
Age at using hearing device		
0-12 month		48 (30.0)
12-24 month		64 (40.0)
24-36 month		40 (25.0)
>36 month		8 (5.0)
Age at cochlear implant surgery		
12-24 month		8 (5.0)
24-36 month		40 (25.0)
36-48 month		80 (50.0)
48-60 month		32 (20.0)
Annual control visits		
1-3 times		24 (15.0)
3-5 times		32 (20.0)
5-7 times		96 (60.0)
Irregular		8 (5.0)
Patient education		
Yes		160 (100.0)
No		0 (0.0)

Min: minimum; max: maximum; SD: standard deviation; #: number

Table 2. Burden of the disease overall and in terms of family, social and emotional life

Overall (the most significant burden)	**n (%)**
Treatment cost	48 (30.0)
Work-related problems	40 (25.0)
Problems with care of other children	24 (15.0)
Physical tiredness	16 (10.0)
Economic	16 (10.0)
Increased need for support	16 (10.0)
Transport problems	8 (5.0)
None	8 (5.0)
Family life	**n (%)**
Increased individual responsibilities	56 (35.0)
Increased stress in the family	56 (35.0)
Improved interpersonal relations and connection	48 (30.0)
Change in social life	**n (%)**
Absent	80 (50.0)
Present	80 (50.0)
New environment	80 (100.0)
Change in entertainment activities	48 (60.0)
Change in relations with friends	24 (30.0)
Change in vacation routine	8 (10.0)
Emotional life (the most predominant emotion)	**n (%)**
Loneliness	71 (44.0)
Inhibition of negative affection	32 (20.0)
Guilt	31 (19.0)
Fear	24 (15.0)
Panic	2 (1.0)

SWLS scores with respect to implant surgery and study variables:

Mean±SD SWLS scores of mothers significantly improved after the implant surgery from preoperative values of 19.1±7.0 to 28.9±4.0 after 12 months of surgery (p<0.000) (Table 3).

Being unemployed vs. employed (p=0.000), having another child with hearing disability (p=0.001), younger (12–24 months) vs. older (>24 months) age of child at the time of implant surgery (p=0.001), absence vs. presence of regular follow-up visits (p=0.002), and presence vs. absence of change in social life after the diagnosis of disease (p=0.001) were associated with significantly lower mean (SD) SWLS scores among mothers indicating poorer satisfaction with life. Sex of the patients had no significant impact on mother's SWLS scores (Table 3).

SWLS scores were positively correlated with patient's age at the time of implant surgery (r=0.206, p=0.009), whereas negatively correlated with the number of household members (r=−0.406, p=0.000) and the number of children (r=−0.310, p=0.000) (Table 3).

Table 3. Satisfaction with Life Scale (SWLS) scores with respect to implant surgery and study variables

	Satisfaction with Life Scale score		
	Mean (SD)	**Median (min-max)**	**p**
Cochlear implant			
Before implant surgery	19.1 (7.0)	19.0 (7-30)	0.000
After implant surgery	28.9 (4.0)	30.0 (14-35)	
Gender of the patient			
Girl	19.4 (7.0)	20.0 (7-30)	0.568
Boy	18.3 (7.1)	19.0 (8-30)	
Age at implant surgery			
12-24 months	7.1 (0.4)	7.0 (7-8)	0.000
>24 months	19.7 (6.6)	19.0 (8-30)	
Employment			
Employed	24.0 (5.3)	24.5 (17-30)	0.000
Unemployed	17.9 (6.9)	19.0 (7-30)	
Another child with hearing loss			
No	19.7 (6.9)	21.0 (7-30)	0.001
Yes	13.5 (5.7)	13.5 (8-19)	
Consanguineous marriage			
Yes	17.8 (6.9)	19.0 (8-30)	0.092
No	19.5 (7.1)	21.0 (7-30)	
Regular annual follow up			
Yes	19.4 (7.1)	19.0 (7-30)	0.002
No	13.0 (0.0)	13.0 (13-13)	
Change in social life			
Yes	17.3 (6.5)	19.0 (7-30)	0.001
No	20.9 (7.1)	21.0 (8-30)	
Correlations		**Satisfaction with Life Scale score**	
Patient age	r	0.206	
	p	0.009	
Maternal age	r	-0.107	
	p	0.180	
#of household members	r	-0.406	
	p	0.000	
#of children	r	-0.310	
	p	0.000	

Min: minimum; max: maximum; SD: standard deviation; #: number

DISCUSSION

Our findings among the mothers of pediatric cochlear implant candidates with profound sensorineural hearing loss revealed significantly improved maternal life satisfaction after the cochlear implant surgery. However; unemployment, having another child with hearing disability, having their children implanted before 24 months of age, crowded household, lack of attention to follow-up, and change in maternal social life due to the disease were the negative factors associated with significantly lower SLWS scores and thus results in poorer maternal life satisfaction.

Cochlear implant surgery was associated with significantly improved postoperative SWLS scores in mothers within 12 months of surgery as compared with the preoperative scores in our cohort. This seems consistent with the heightened levels of stress reported to be experienced by parents of cochlear "non-implanted" vs. cochlear "implanted" deaf children and the significant decrease in the intensity of stress experienced by the parents after the cochlear implant surgery, even to levels comparable to those of the parents of a child with normal hearing ability [16].

Similarly, in a past study among the mothers of cochlear implanted children, cochlear implantation was reported to be associated with a decrease in the level of maternal depression, anxiety, and stress and emphasized to have a potential to improve maternal psychological parameters [6].

Nonetheless, it should be noted that the parents of cochlear implanted children were reported to experience higher levels of stress and poorer psychological adjustment than those of normally hearing children [10, 17, 18].

In a past study in Turkey among 161 cochlear implanted pediatric patients, preoperative period and first week after surgery were considered to be extremely stressful by 93.1% of the parents, whereas 93.2% stated that they were relaxed after realization of the first response of their child to their voice [3]. Continued parental stress after the surgery has been considered to be associated with ongoing demands of the children as well as a gradual increase in communication and behavior problems [9].

Child's age at the time of implantation is considered to have a significant inverse impact on the postoperative outcomes, with better outcomes expected for those with younger age [19]. Several studies reported better performance among children implanted before 2 years of age than those implanted at older ages [1, 20, 21]. Hence, preoperative poorer life satisfaction among the mothers of children implanted "before" versus "after" 2 years of age in our cohort seems likely to be related to experiencing an unnecessarily high sense of urgency, anxiety, and pressure about accessing the implant option in the preoperative period [13]. Nonetheless, given the suggestion of a quicker and more complete adaptation to a cochlear implant in case of earlier interventions [22], their life satisfaction scores seem to markedly improve in the postoperative period provided their expectations are realistic regarding their child's condition [13].

Although developments in newborn hearing screening led to an earlier and easier diagnosis of hearing loss with a reduction in the age at diagnosis, amplification, and intervention, past studies indicated that a considerable delay exists between the age at identification of hearing loss and age at cochlear implantation [23, 24]. Parent's low level of awareness regarding cochlear implantation, low educational level, and lack of financial resources were suggested among the possible reasons for delays in performing cochlear implantation [23, 25]. In our study, while 40% of children were diagnosed before 6 months of age and 70% before 12 months of age, only 30% were using the hearing device at 12 months of age and only 5% were using the cochlear implant at 24 months of age. Likewise, in a past study from Turkey, low level of parental knowledge and low socioeconomic status were considered to be responsible for the delay in identification of hearing loss and the increase in the time lapse between amplification and intervention [26].

In fact, among multiple factors affecting developmental outcomes of children with hearing impairment, the effect of timing of intervention is considered the minimal as compared with other demographic factors related to the child and family [13, 27].

Indeed, parent's daily problems in relation to raising deaf children (socialization, habilitation demands, and parenting role, financial difficulties, services) were reported to be correlated with stress levels and life satisfaction [28]. Authors also noted that spouses and other parents were identified as partners for the collaborative daily problem solving and coping by parents of deaf children [28]. Notably, despite increased individual responsibilities and increased stress in the family environment after the diagnosis of disease, mothers in our cohort also identified improved interpersonal relations and connection within the family.

Moreover, our findings are also in line with the feelings of guilt and tiredness related to the increased responsibility of being a teacher or trainer alongside a mother/father of the child, and thus concerns about performance failure reported among parents of children with hearing disabilities [11, 29]. These feelings have also been suggested to result in joining support groups comprising other parents with hearing-impaired children or connecting with associations and community centers [29, 30].

Mothers in our cohort identified occupational life, care of other children, and increased individual responsibilities as the most problematic areas of parenting a child with a hearing disability. This supports the statement that parents, especially mothers, felt responsible for their child's outcomes and take many roles and are at risk of experiencing negative emotions, such as guilt and unhappiness, in case of poor outcomes [2, 31, 32].

Consistent with the 80% unemployment rate in our cohort, having children with disabilities was reported to cause some parents to quit their job leading to significant financial problems for the families [11, 33]. Indeed, being unemployed, the presence of a crowded household, the number of children, and disease-related changes in social life were the factors associated with a poor maternal life satisfaction in our cohort. This supports the reported relation of employment status, occupational competence, role overload, number of children, and social support to health and life satisfaction of mothers [34].

Hence, our findings emphasize the importance of implementing family-centered intervention programs with close attention to the emotional experiences of mothers, the availability of the support networks, and the level of occupational competence alongside consideration of efforts to enhance family relationships or increase awareness and perceptions of the available support [2, 7, 34].

Notably, incorporating parents as inalienable members in the rehabilitation process and considering individual needs and family dynamics via persistent and long-term multi-dimensional auditory-verbal intervention program and counseling were shown to be associated with positive effects in a past study among hearing-impaired children's parents in Turkey [35].

Additionally, problems with transportation to the implantation center, lack of access to special services as well as travel and commuting costs to the rehabilitation centers were identified among the significant problems experienced by families with cochlear implanted children, including those from Turkey [3, 11, 35]. This seems notable given that timely detection and action in hearing disorders necessitates access to high-quality screening and diagnosis services in the area [11].

CONCLUSION

In conclusion, our findings revealed the association of cochlear implantation with a significant increase in the mother's life satisfaction, despite sociodemographic factors with a negative impact on life satisfaction such as unemployment, the presence of another child with hearing disability, crowded household, and change in social environment. Hence, our findings emphasize the increased parental awareness about the role of earlier provision of a cochlear implant in terms of not only improved hearing outcomes in the children but also improved maternal life satisfaction, provided that maternal expectations are realistic in relation to their individual child's condition. Our findings also emphasize on the consideration of family systems with special attention to the mother's emotional experiences and occupational competence along with the availability and awareness of support networks in the family-centered intervention programs.

Ethics Committee Approval: The study was conducted in accordance with the ethical principles stated in the "Declaration of Helsinki" and approved by the institutional ethics committee (Date/Protocol No: 2012/13).

Informed Consent: Written informed consent was obtained from each mother following a detailed explanation of the objectives and protocol of the study.

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