Int. Adv. Otol. 2013; 9:(1) 46-54

ORIGINAL ARTICLE

Parental Anxiety and Influential Factors in the Family with Hearing Impaired Children: Before and After Cochlear Implantation

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Objective: As a parent of a child whose hearing is impaired, it is normal to feel frustrated, challenged or anxious. However, currently, most of children with hearing impairment can find a remedy for their disability through early diagnosis and early rehabilitation with hearing aids or cochlear implant, and so parents could feel shed light on the disability of their child. Nothwithstanding, the level of anxiety may also vary according to personality and socio-demographic properties of parents. It is also assumed that mothers will be more anxious than fathers, because the mother serves primary caretaker of the child.

Materials and Methods: In this prospective study, anxiety level of 25 parents who have hearing impaired children that underwent cochlear implantation was compared before and after cochlear implantation by giving them Beck Anxiety Inventory. In addition, personality and socio-demographic properties that contribute to anxiety levels were investigated using by Revised Eysenck Personality Questionnaire-Abbreviated, Cope Inventory, Penn State Worry Questionnaire and Problem Solving Inventory.

Results: Mothers were more anxious and neurotic, and their anxiety levels were correlated with neuroticism. Mothers' and fathers' anxiety levels were significantly decreased after cochlear implantation. We did not find statistically significant correlation between anxiety levels and socio-demographic characteristics of mothers, but the results were slightly different for fathers.

Conclusion: Anxiety is common in families with hearing impaired children, and the level of anxiety may vary according to family dynamics. However cochlear implant can be a solution to reduce the level of concern.

Submitted : 27 November 2012 *Accepted : 11 January 2013*

Introduction

No parents want to imagine that their baby would be born with any physical or mental disorder. However about 2 or 3 in every 1000 babies are born with a birth defect [1, 2]. Certainly, the birth of a handicapped child is a traumatic experience for parents. The first reaction of parents may be denying or not being able to accept the reality. Parents may feel anger, sadness or guiltiness [3]. After a while, they may learn to embrace their child as he or she is, but at this time, they concern about the challenges and life-course facing them, because caring for a child with a disability causes a great deal more work and anxiety for parents.

However, when parents start to receive information about the treatment options for their child's disability from their friends, social media or health and social service professionals, their worry or anxiety may be reduced to a great extent. The level of anxiety caused by having a child with disabilities may also change according to several factors such as the level of the mental or physical disability, the socio-economic status of the family, how educated the family is, parents'

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professions, their marriage harmony, whether the family has social security and whether they have access to medical services. Additionally, it is assumed that mothers will be more anxious than fathers, because the mother serves primary caretaker of the child [4- 6] .

Parents with a hearing impaired (HI) children also have the similar experience and course mentioned above. But most of children with hearing impairment can find a remedy for their disability through early diagnosis and early rehabilitation with hearing aids or cochlear implant, and so they can catch up to their peers in all developmental stages. Such an outcome would undoubtedly be very pleasing for parents of HI children, and their anxiety caused by having a child with disability may be decreased [7, 8].

In the present study, the anxiety level of parents who have HI children that underwent cochlear implantation (CI) was compared before and after CI by giving them an anxiety scale. The anxiety scale was given to mothers and fathers separately before CI, at 6th months and 1st year after CI. The aim of the study was to investigate personality and socio-demographic properties that contribute to anxiety levels as well as the role of CI and motherhood in anxiety levels.

Material and Methods

This prospective study was conducted by Otorhinolaryngology and Psychiatry Department of Eskisehir Osmangazi University Faculty of Medicine. The study was approved by the ethics committee of the university with the number PR-12022904, and the consents were obtained from participants including the study.

Study Group:

The study population was composed of parents who have an HI child scheduled for CI. Parents with any psychiatric disorders and / or illiterate parents who cannot fill the questionnaires were excluded from the study. Twenty five parents who meet these criteria voluntarily participated in the study.

Study Design:

The socio-demographic properties of parents were recorded from the hospital files and themselves. Revised Eysenck Personality Questionnaire-Abbreviated, Cope Inventory, Penn State Worry Questionnaire and Problem Solving Inventory were used to assess the personality traits and cope attitudes of parents. Beck Anxiety Inventory was used to measure anxiety levels of parents. A brief description of each inventory is below.

All of the questionnaires were first filled out to both mothers and fathers separately before CI. Beck Anxiety Inventory was filled out again at 6th months and 1st year after CI. Anxiety levels measured before and after CI were compared statistically. The levels of anxiety of mothers were compared with those of fathers to determine the effect of mothering on anxiety levels. Personality differences between mothers and fathers were identified, and the statistical relationship between personality traits and the level of anxiety was investigated. The effects of demographic properties (age and gender) of children and socio-demographic properties of parents (age, educational level, level of income, living space, number of children and number of children with disabilities) on anxiety levels were also determined.

Beck Anxiety Inventory (BAI):

It measures the frequency of anxiety experienced by the individual. It is a Likert-type self-report assessment scale included 21-items rated from 0 to 3 points. Increased total score indicates the frequency of anxiety experienced by the individual. It was developed by Beck[9] et al. in 1988. Turkish reliability and validity was performed by Ulusoy et al. (Ulusoy M. 1993, Beck Anxiety Inventory: validity and reability, unpublished thesis, Bakırköy Hospital for Mental and Nervous Disorders, İstanbul)

Assessment of Coping Attenuations (COPE) Inventory:

It was developed by Carver [10] et al. to identify the coping strategies used in stressful circumstances. Analysis of reliability and validity of Turkish form was performed by Agargun [11] et al in 2005. This scale is self-report scale consisting 60 questions. It is answered through the four options. These answers are as follows; 1- I never do anything like that, 2- I do very little, 3- I moderately do and 4- I mostly do. COPE consists of 15 subscale: 1- Active coping, 2- Restraint coping, 3- Planning, 4- Seeking social support instrumental, 5-Suppression of competing activities, 6- positive reinterpretation and growth 7- Turning to religion, 8- Humor, 9- Seeking social support- emotional, 10- Acceptance, 11- Behavioral disengagement, 12- Alcohol – drug disengagement, 13- Denial, 14- Mental disengagement, 15- Focus on and venting of emotions. Totally, from 4 to 16 scores can be taken from

each subscale. Total score at first 5 of these subscales indicates aspects of problem-focused coping, total score at 6-10th subscales indicates emotion-focused coping and total score at last 5 subscales indicates non-functional coping (arguably are less useful).

Problem Solving Inventory (PSI):

Problem Solving Inventory was developed by Heppner and Peterson[12] to assess one's perceived ability in problem-solving behaviors and attitudes. Its Turkish adaptation study was performed by Sahin [13] et al in 1993. PSI is a 6-point (hasty approach, thinking approach, avoidant approach, estimator approach, self-confident approach and planned approach) Likert-type scale consisting 35 items. Thirty two items are evaluated because of nature of scale. Minimum score is 32 and maximum is 192. Higher scores show that person perceives himself to be inadequate about problem solving skills.

Penn State Worry Questionnaire (PSWQ):

It is a self-report scale which consist 16 questions to identify the level of excessive, constant and uncontrolled pathological worries. PSWQ was developed by Meyer[14] et al in 1990. Items measure from 0 to 5 points. Higher reliability and validity values were reported for Turkish form of scale [15].

Revized Eysenck Personality Questionnaire-Abbreviated (EPQR-A):

Francis et al. [16] created EPQR-A by revising Eysenck Personality Questionnaire and its short form. The questionnaire includes 24 items and it evaluates the personality into 3 main factors: extraversion, neuroticism and psychoticism. Also, bias during implementation of the questionnaire is aimed to prevent by lying subscale. Participants are asked to respond to 24 questions as Yes (1) or No (0). Score ranges from 0 to 6 for each personality traits. Turkish reliability and validity was performed by Karanci et al [17] in 2007.

Statistical evaluation:

Statistical analysis was performed using IBM SPSS Statistics version 20. All measurements were evaluated by the Kolmogorov-Smirnov test for normality. For the normally distributed variables, independent samples t test were used, and for the non-normal variables Mann-Whitney test, Kruskal-Wallis test and Friedman's two-way ANOVA by ranks were used according to the types of groups. Chi-Square analyses were used to determine the dependency between categorical variables. Pearson and Spearman correlation coefficients were applied to investigate the relationship between the variables. The p value less than 0.05 ($p<0.05$) was accepted significant.

Results

The study consists of parents (mothers and fathers) of 25 (13 female, 12 male) children with hearing impairment.

Demographic properties of children:

The mean age of children was 5,16 ± 0.83 years (range 1 to 16). Twenty-two (88%) children had prelingual, 1 (4 %) child had perilingual, 1 (4 %) child had congenital progressive and the remaining 1(4 %) child had post lingual profound sensorineural hearing loss (SNHL). Fifteen (68.1%) out of 22 children with prelingual hearing loss were identified through newborn hearing screening programme. None of the children had any disabilities in addition to hearing loss. All children have used bilateral conventional hearing aid before CI. No complications were observed in any child during or after surgery. All children were covered by their parents' health insurance.

Socio-demographic properties of parents:

The mean age were 32, 20 ± 1.40 (range 30 to 38) and 36, 16 ± 1.55 (range 32 to 43) years for mothers and fathers, respectively**.** The age of parents showed no significant difference. Twenty (80%) of 25 families were from big-cities, 3 (12%) were from small-cities and 2 (8%) were from the village. The majority (12 families, 48%) of families had 2 children. Three (12%) families had 3 children, and the other 3 (12%) families had 4 children. The remaining 7 families (28%) had only 1 child. Only 2 (8%) families had more than one disabled child. These both families had 2 disabled (HI) children that one of them was enrolled in the study. Table 1 provides occupational (was divided in 2 groups as unemployed and employed) and educational information of parents. There was no difference between the mothers and fathers in terms of education. However, significant differences were found in terms of professions ($p < 0.001$). In 16 (64%) families, monthly income was between minimum wage and 1500 TL. The remaining 9 (36%) families' monthly income was more than 1500TL.

Personality traits and cope attitudes of parents:

The scores of neuroticism ($p=0.007$) and lie ($p=0.022$) subscales were found significantly different between parents in favor of mothers.

Table 1. The occupational and educational informations of parents

	FATHERS (n = 25)	MOTHERS (n = 25)	p
OCCUPATİONAL INFORMATION			
unemployed	4	23	< 0.001
employed	21	2	(Yates' chi- square test)
LEVEL OF EDUCATION			
elementary school	5	10	=0,150
secondary school	5	7	(Exact chi- square test)
high school and university	15	8	

Anxiety levels of parents:

The anxiety levels measured before CI and after CI (at 6th months and 1st year) are shown in Table 2. There was significant difference between anxiety levels of mothers and fathers measured before CI, at 6th months and 1st year after CI. Mothers were more anxious in all 3 period. Level of anxiety of mothers was decreased significantly after CI, and there was significant difference between levels measured at 6th months and 1st year after CI. Anxiety levels of fathers were also decreased significantly after CI, but there was no significant difference between levels measured at 6th months and 1st year after CI.

Correlation between anxiety levels of parents and properties of children and parents:

Table 3 provides the summary of our results. As shown in Table 3, there was no statistically significant correlation between gender of children and anxiety levels of parents. However the mean anxiety scores for boys were higher in both mothers and fathers (Table 4). There was also no statistically significant correlation between living space and anxiety levels of parents, but the mean anxiety scores of parents who live in the village were higher (Table 5).

Correlation between anxiety levels of parents and their personality traits and cope attitudes

The anxiety levels of mothers were correlated positively with nonfunctional coping (behavioral disengagement, substance abuse) strategies scores, with neuroticism and with the scores of PSWQ. Additionally, there was a negative correlation between the problem-focused coping (positive reinterpretation and development) strategies and anxiety levels of mothers. Anxiety levels of fathers were correlated positively with nonfunctional coping (Mental disengagement), emotion-focused coping (laugh off, acceptance) strategies and with the scores of PSWQ.

Table 2. The anxiety levels of parents, before and after CI (measured by Beck Anxiety Inventory)

	ANXİETY LEVELS			
	Before CI Mean ± Standart Error Median (25th-75th) %	**After CI (at 6th months)** Mean ± Standart Error Median (25th-75th) %	**After CI (1st year)** Mean ± Standart Error Median (25th-75th)%	**p-1**
MOTHERS	20,96±3,13 15(9,5-29)	11,88±1,67 10(5,5-17,5)	7.12 ±0.99 7(4-10)	< 0.001
FATHERS	11,36 ± 2,14 7(3,5-17,5)	5,16±0,97 4(0,5-8,5)	3.56±0.79 3(0-6,5)	< 0.001
p-2	0.014	0.002	0.006	

p-1: Friedman's two –way ANOVA by ranks
p-2: Mann-Whitney U test

Table 3. The correlation between anxiety levels of parents and properties of children and parents

	ANXİETY LEVELS OF PARENTS
I. Demographic properties of children	
Age	Statistically no significant relationship
Gender	Statistically no significant relationship, but the mean anxiety level for boys is numerically higher in both mothers and fathers.
II. Socio- demographic properties of parents	
Age	Statistically no significant relationship in mothers, but there was a positive relationship (p 1= 0.015) between age of fathers and their anxiety levels measured before CI.
Education level	Anxiety levels of mothers measured before and after CI were not affected by the education. However, anxiety levels of fathers measured after CI affected by the education (negative relationship). (p 2= 0.001, p 3=0.005)
Level of income	Statistically positive relationship between anxiety levels of fathers. (p 1= 0.017, p 2= 0.023, p3 = 0.004)
Living space	Statistically no significant relation, but the mean anxiety level of parents who live in the village was numerically higher.
Number of children to have in a family	Statistically no significant relation
Number of children with disabilities to have in a family	Statistically no significant relation in mothers, but there was a positive relation (p 1= 0.04) in fathers before CI.

p1: p value calculated pre CI
p2: p value calculated at 6 th months after CI
p3: p value calculated at 1 st year after CI.

Table 4. The relationship between gender of children and anxiety levels of parents

	The level of anxiety of mothers			
	Before CI Mean ± Standart Error Median (25th-75th) %	**After CI (at 6 th month)** Mean ± Standart Error Median (25th-75th) %	**After CI (at 1st year)** Mean ± Standart Error Median (25th-75th) %	**p1**
Girl	18.53 ± 3.76 17(7-28.5)	10.53 ± 2.42 11(1.5-17.5)	6.23 ± 1.31 6(1-9.5)	< 0.001
Boy	23.58 ± 5.17 14.5(10.75-36.75)	13.33 ± 2.34 9.5(8.25-18.75)	8.08 ± 1.50 7(4.25-10.59)	< 0.001
p2	0.689	0.611	0.574	
	The level of anxiety of fathers			
	Before CI Mean ± Standart Error Median (25th-75th) %	**After CI (at 6 th month)** Mean ± Standart Error Median (25th-75th) %	**After CI (at 1st year)** Mean ± Standart Error Median (25th-75th) %	**p1**
Girl	10 ± 3.21 6(3-15.5)	3.92 ± 1.22 3(0-5.5)	3 ± 0.84 3(0-6.5)	0.016
Boy	12.83 ± 2.87 13.5(3.25-18.25)	6.5 ± 1.57 6.5(1.25-9.75)	4.16 ± 1.40 3(0-6.25)	0.001
p2	0.406	0.205	0.769	

P1: Friedman's two-way ANOVA by ranks
P2: Mann–Whitney U test

Table 5. The relationship between living space and anxiety levels of parents

	The level of anxiety of mothers			
	Before CI Mean ± Standart Error Median (25th-75th) %	**After CI (at 6 th month)** Mean ± Standart Error Median (25th-75th) %	**After CI (at 1st year)** Mean ± Standart Error Median (25th-75th) %	**p1**
Big-city	17.75 ± 2.59 15 (9.25-25)	10.55 ± 1.61 10 (5.25-15)	6.65 ± 1.02 6.50 (4-8.75)	< 0.001
Small- city	25.66 ± 16.82 13 (9-36)	10.66 ± 4.97 9 (6-14.5)	6.00 ± 2.64 5 (3.5-8)	= 0.05
Village	46.00 ± 8.00 46 (38-54)	27.00 ± 5.00 27 (22-32)	13.50 ± 5.50 13.5 (8-19)	= 0.135
p2	0.163	0.108	0.242	
	The level of anxiety of fathers			
	Before CI Mean ± Standart Error Median (25th-75th) %	**After CI (at 6 th month)** Mean ± Standart Error Median (25th-75th) %	**After CI (at 1st year)** Mean ± Standart Error Median (25th-75th) %	**p1**
Big-city	9.45 ± 1.98 6 (3.25-15.25)	4.00 ± 0.83 3.5 (0.25-6)	2.80 ± 0.79 2.50 (0-3.75)	< 0.001
Small- city	13.33 ± 7.51 14 (7-20)	8.33 ± 4.91 8 (4-12.5)	6.00 ± 3.60 4 (2.5-8.5)	= 0.529
Village	27.50 ± 12.50 27.5 (15-40)	12.00 ± 2.00 12 (10-14)	7.50 ± 0.50 7.5 (7-8)	= 0.135
p2	0.216	0.092	0.086	

P1: Friedman's two-way ANOVA by ranks
P2: Mann–Whitney U test

Discussion

Congenital hearing loss is one of the most common birth defects, which affects as many as 2 per 1000 live births[18,19]. A baby with congenital hearing loss may develop mental disability, emotional and social disturbance as well as speech and language delays if they do not diagnose and rehabilitate in the early year of life[20]. Hearing loss can also impose a heavy social and economic burden on families. Parents may feel helpless and would not know how to deal with these troubles. Many parents use the same word –'nightmare' – to describe their feelings. Therefore they should seek professional help to receive information about possible remedies or treatment options to overcome their child's disability.

Treatment options for children with hearing loss depend upon the condition and degree of hearing impairment. CI is a device that provides direct electrical stimulation to the auditory nerve in the inner ear and offers the opportunity for children with a severe to profound SNHL to acquire age-appropriate language skills[21]. The parents with cochlear implanted child also feel more secure and less anxious, as they view their child's positive development. There are several studies showed that CI provides a positive impact on quality of life among patients and their relatives[7, 22- 24]. The findings of our study also indicated that anxiety level of parents with HI child decreases after CI, and this result also show that cochlear implant surgeries were successfully performed in this children.

However the level of anxiety occurring in any challenging situation and to be content with the solution produced for this distress may also vary according to several factors. For instance, in a study designed to identify predictors of parental stress and psychological distress among parents of children with mental retardation, Khamish [5] reported that socioeconomic level, the age of child and fathers' work were associated with symptom rates of cognitive disturbance, depression and anxiety among parents. Mu [25] et al. showed that mothers' educational level did significantly affect maternal depression symptoms in the study related with depression in mothers of children with epilepsy. In our study, we did not find statistically significant correlation between anxiety levels and socio-demographic characteristics of mothers, but the results were slightly different for fathers as shown in Table 3. There was statistically positive correlation between anxiety levels of fathers and level of income of families. However it was expected that families with high income would have lower anxiety level, because it could be easier to find a way to access to health and social service professionals for that families. We thought that this discrepancy may be due to education level of fathers. Therefore we analyzed relationship between education level of fathers and income level of families, and interestingly, we found that fathers of families with high income mostly had low level of education. As seen in Table 3, father's anxiety levels after cochlear implantation also has been found negatively related with father's educational background.

In addition to education and income level, living space is another factor that may affect anxiety level of parents. Parents who live in the rural areas may not easily access to health and social service professionals, and they will be more anxious. We also found that the mean level of anxiety of parents who live in the village was higher (Table 5). However there was no statistically significantly relationship between living space and anxiety level of parents, and this result may probably be due to the small number of participants in our study. This probability may also explain our statistically insignificant result related with relationship between anxiety level of parents and gender of children; we expected that anxiety levels of parents will be significantly higher for boys due to socio-cultural characteristics of our country, because our country have still highly male dominated society, and a son is often viewed as a family's most valuable resource. In our study, the mean levels of anxiety of parents also were higher for boys, but it was not statistically significant (Table 4).

The individual's personal structure can also affect the level of anxiety [26, 27]. An incident that arises in a persons' life may be overwhelming to one individual, yet to another it may be normal and perfectly acceptable. The reason of using EPQR-A in the presented study is also to analyze the personality of parents. Neuroticism and lie were found significantly different between parents in our study. Mothers were more neurotic and mothers' anxiety levels were correlated with neuroticism. Of course, this result is not surprising, because it is proposed that neuroticism is associated with anxiety, depression, and low self-esteem, emotional and irrational behavior [26]. The studies evaluating cross-cultural similarities and differences in personality characteristics revealed that Eysenck's personality dimensions differ according to gender [26, 27]. These studies reported that women had high scores than men in neuroticism and lie subscales. The results of our study also support these results.

The gender also affects the level of anxiety. Responses to stress of men and women faced the same stress may be different [28]. We also found significant difference between anxiety levels of mothers and fathers both before and after CI. This result may be of course due to gender, but it is probably due to the role of motherhood. As women carry the child and give birth, they form a bond with the child much sooner than the father. The physicians, therefore, have to understand and tolerate the concern of mothers even if it may seem exaggerated.

Coping styles with stress also changed according to the gender. Carver [11] et al. divided the efforts to cope with stress into 15 sub-groups (COPE ınventory). These sub-groups are divided into three groups as problem-focused, emotion-focused and nonfunctional coping strategies. Problem-focused coping strategies are more effective to cope with stress. It has been reported with some studies that men are tendency to use problem focused coping, while the women are tendency to use emotion-focused and nonfunctional coping strategies to cope with stress [29,30]. The anxiety levels of mothers were also correlated positively with some nonfunctional coping strategies scores in our study. However, we did not find obvious correlation

between problem-focused coping scores and anxiety level of fathers, we found, on the contrary, positive correlation between nonfunctional coping scores and their anxiety levels. This result could be due to feeling responsible for having a disability child prevents an effective way to cope with stress. Many studies also showed that problem-focused coping strategies are associated with less anxiety, while emotion-focused and nonfunctional coping strategies are associated with more anxiety [31, 32]. This hypothesis was also confirmed with the findings of mothers in our study, because the anxiety levels of mothers were correlated negatively with the problem-focused coping scores.

The remarkable finding of our study was that anxiety levels of both mothers and fathers were reduced significantly after CI, although they were tendency to use non-functional strategies that are usually not effective to cope with stress. According to us, this favorable result is thanks to successful CI surgeries that satisfy the parents as they view their child's evident positive development.

In conclusion, anxiety is common in families with HI children, and it may impair the quality of life of families. The anxiety level may vary according to family structure. It is natural that mothers may be traditionally more worried than fathers. CI can be a solution to reduce the level of concern caused by having a child with disability. Therefore, during the processes cochlear implantation, the physicians should interview with parents, find out their most important concerns and encouraged them to solutions proposed for their disabled child. So, parental anxiety related to handicapped child can be decreased with the help of the physicians and social workers that are able to put parents in touch with appropriate resources to increase their knowledge and understanding. The parents that their anxiety does not decrease with a clinical interview should also be consulted to psychiatrist or psychologist.

Conflict of interest: None

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