

Original Article

Depression, Anxiety, and Quality of Life in Patients with Cochlear Implant: A Case-Control Study

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BACKGROUND: It is known that there is a relationship between hearing loss, which is an important cause of disability, psychological symptoms, and low quality of life. The aim of this study is to evaluate the anxiety, depression levels, and quality of life analysis of adults with postlingual hearing loss and who have undergone cochlear implants and to compare them with the data of subjects who have never had a hearing loss.

METHODS: The prospective controlled clinical study included 53 subjects who had cochlear implants and 52 healthy controls in terms of hearing. Hospital Anxiety and Depression Scale and Short Form 36 were filled by all subjects to investigate their depression, anxiety, and quality of life levels.

RESULTS: The mean age of subjects was 42.88 ± 18.04 , and 44% (23) were women. There was no significant difference between the study and control groups in terms of Hospital Anxiety and Depression Scale scores. Short Form 36 physical role ($P = .018$) and SF-36 general health ($P = .014$) in quality of life assessment sub-scores were statistically significantly higher in the study group than in the control group. When the correlation between the time elapsed after surgery and Hospital Anxiety and Depression Scale scores and Short Form 36 scores was evaluated, no significance was observed.

CONCLUSION: The fact that the patients evaluated after cochlear implant surgery had similar depression and anxiety levels and quality of life as the controls, and even physical role and being significantly better in general health compared to the controls reveal the importance of regaining the hearing ability.

KEYWORDS: Anxiety, cochlear implant, depression, hearing loss, quality of life

INTRODUCTION

Hearing, which is one of the most important senses in communicating with the outside world, is the perception created as a result of the sound energy proceeding from the outer and middle ear, being processed in the inner ear, and transmitted to the upper central centers through the auditory pathways.¹ Hearing loss occurs as a result of a malfunction that may occur in any of the pathways that mediate hearing and is classified as mild, moderate, severe, or very severe hearing loss according to the severity of the hearing loss.² The type of loss can be sensorineural type, conduction type, and mixed type depending on the anatomical feature. Sensorineural hearing loss can be caused by pathological conditions in every region from the inner ear to the auditory center.² Hearing loss is also termed depending on the period in which it is experienced. Accordingly, prelingual hearing loss is the loss that occurs before language development is completed in childhood, while postlingual hearing loss is the loss that occurs suddenly or gradually after language development is completed. Hearing loss that occurs while language development is continuing but not yet completed is named prelingual hearing loss.^{3,4}

Hearing loss can occur due to aging, genetic factors, noise, trauma, infections, and use of ototoxic drugs, and it affects more than 360 million people around the world. Thus, these subjects can isolate themselves from the social environment.⁵ Relations with family and environment, educational status, and individual self-perception are negatively affected. In addition to all these, an increase in depression, anxiety, and other mental health problems is observed in subjects with hearing loss.⁶ It is possible to prevent mental problems caused by hearing loss with devices that provide hearing rehabilitation.⁷ Hearing rehabilitation can be provided with cochlear implants that transfer mechanical sound energy directly to the cochlea as electrical signals in subjects where conventional

hearing aids do not benefit enough or with brainstem implants in subjects where the cochlea cannot be used.^{1,8} It has been determined that with the increase in hearing and speech production in patients with cochlear implants, self-consciousness, daily activities, and social functionality can increase in daily life.⁹

The aim of our study is to evaluate the anxiety, depression levels, and quality of life analysis of adults with postlingual hearing loss and who have undergone cochlear implants and to compare them with the data of subjects who have never had a hearing loss.

METHODS

This prospective controlled clinical study was approved by the Clinical Research Ethics Committee of Istanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital (Date/number: 2021/0405).

Between November 2015 and August 2021, the number of patients with postlingual sensorineural hearing loss who underwent cochlear implant surgery in our clinic was 58. A total of 53 adult subjects, 24 women and 29 men, who had unilateral cochlear implants, were included in the study. Five postlingual cochlear implant recipients could not be reached due to changes in their contact information. In our country, the social insurance institution only covers cochlear implant surgery in 1 ear for adult patients so the subjects performed unilateral cochlear implants. The inclusion criteria for the study were that subjects were older than 18 years of age and had postlingual hearing loss. As the control group, 52 subjects with normal hearing in a similar age range, 23 women and 29 men, were included.

While face-to-face interviews were made with some of the patients who agreed to participate in the study, some patients who did not want to come to the hospital due to the prevailing pandemic conditions were interviewed via telephone. All subjects participating in the study were informed about the study, and informed consent was obtained.

The patients' anxiety, depression, general health status, and quality of life assessments were made using the Short Form 36 (SF-36) and the Hospital Anxiety and Depression Scale (HADS).

Short Form 36 is a self-report scale. It provides the opportunity to evaluate 8 different dimensions of health in 36 questions. Physical function, social function, limitations due to physical and emotional reasons, emotional well-being, pain, energy and fatigue, and general health perception. In the evaluation of the subscales between 0 and 100, the higher the score, the better the quality of life is interpreted. It is reported that it can be used in the evaluation of the quality of life in patients with physical illness.

The HADS consists of 14 questions in total, 7 questions evaluating anxiety and 7 questions evaluating depression. For each question, subjects are asked to score between 0 and 3 to evaluate their own situation. The cut-off score was 10 for anxiety and 7 for depression. In total, while the score range of 7 and below is normal, the limit value between 8 and 11 is considered border, and a score of 11 and above is considered abnormal. Aydemir¹⁰ adopted it to the Turkish population.¹⁰

Statistical Analysis

Statistical Package for Social Sciences (Chicago, Ill, USA) version 20.0 was used for the statistical evaluation of the findings. Numerical data were expressed as mean \pm standard deviation. Categorical data were given as numbers (n) and percentages (%). The chi-square test was used to compare categorical data. Pearson correlation test was used in the correlation analysis since the data were normally distributed. A $P < .05$ value was accepted for statistical significance.

RESULTS

A total of 105 subjects, 53 in the study group and 52 in the control group, were included in the study. The mean age of the study group was 42.88 ± 18.04 (range, 18 to 80), and the mean age of the control group was 42.13 ± 16.91 (range, 18 to 82). Forty-five percent (24) of the study group and 44% (23) of the control group were women.

The postoperative time of the study group in which cochlear implants were applied was 36.15 ± 22.44 months (range 4 to 73).

Postoperative cochlear implant pure tone audiogram results of the subjects were found to be a maximum of 15 dB and a minimum of 65 dB at 250-500-1000-2000-4000-6000 Hz. The average hearing level of subjects at all frequencies is 35 dB and the average speech discrimination level is 82%.

There was a negative significant correlation between hearing thresholds and the mental health subscale of SF-36 ($P = .041$, $r = -0.302$) while not between HAD scores (Figure 1) and other SF-36 subscale scores (Figure 2).

There is no correlation between speech discrimination level and SF-36/HAD scores. Consequently, the improvement in hearing level is associated with mental health subscale of SF-36, regardless of the speech discrimination score (Figures 3 and 4)

There was no significant difference between the study and control groups in terms of Hospital Anxiety and Depression Scale-Depression (HAD-D), Hospital Anxiety and Depression Scale-Anxiety (HAD-A), and Hospital Anxiety and Depression Scale-Total (HAD-TOTAL) scores ($P = .278$, $P = .616$, and $P = .392$, respectively). While all scores were within normal limits, only the HAD TOTAL mean score of the control group was found to be just above 11, which is considered the normal limit.

Short Form 36 physical role in the quality of life assessment ($P = .018$) and SF-36 general health ($P = .014$) sub-scores were statistically significantly higher in the study group than in the control group.

Scale score averages and comparisons are presented in Table 1.

In addition, when the correlation between the time elapsed after surgery and HAD-D, HAD-A, and HAD-TOTAL ($P = .735$, $P = .510$, and $P = .848$, respectively) and SF-36 (physical function $P = .142$; physical role $P = .773$; emotional role $P = .944$, energy vitality $P = .701$, mental health $P = .0942$, social functionality $P = .911$, pain $P = .719$, general health $P = .409$) was evaluated, no significance was observed.

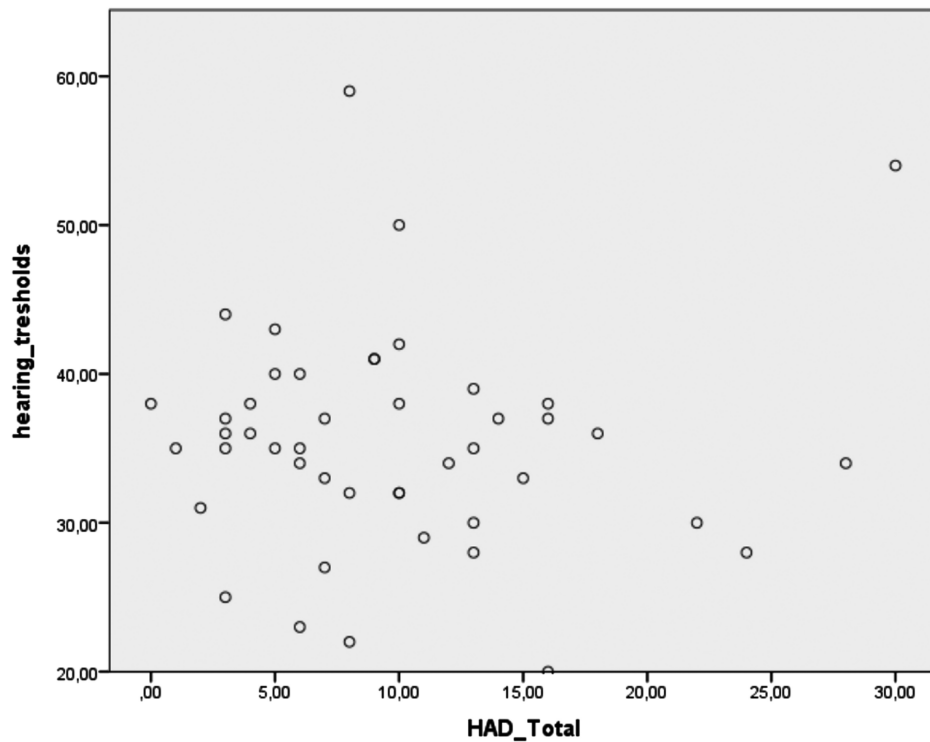


Figure 1. Correlation between hearing thresholds and HAD total scores. HAD, Hospital Anxiety and Depression Scale.

DISCUSSION

In this study, patients who have undergone cochlear implant surgery for postlingual severe sensorineural hearing loss and those who have not experienced hearing loss before were compared in terms of anxiety, depression, and quality of life.

In our sample, the mean age of the study group was 42.88 ± 18.04 years, and it was similar in the control group (42.13 ± 16.91). It is noteworthy that in most of the studies conducted in this area with patients who underwent cochlear implantation, the older age range was addressed.¹¹ Many factors that may affect the psychosomatic

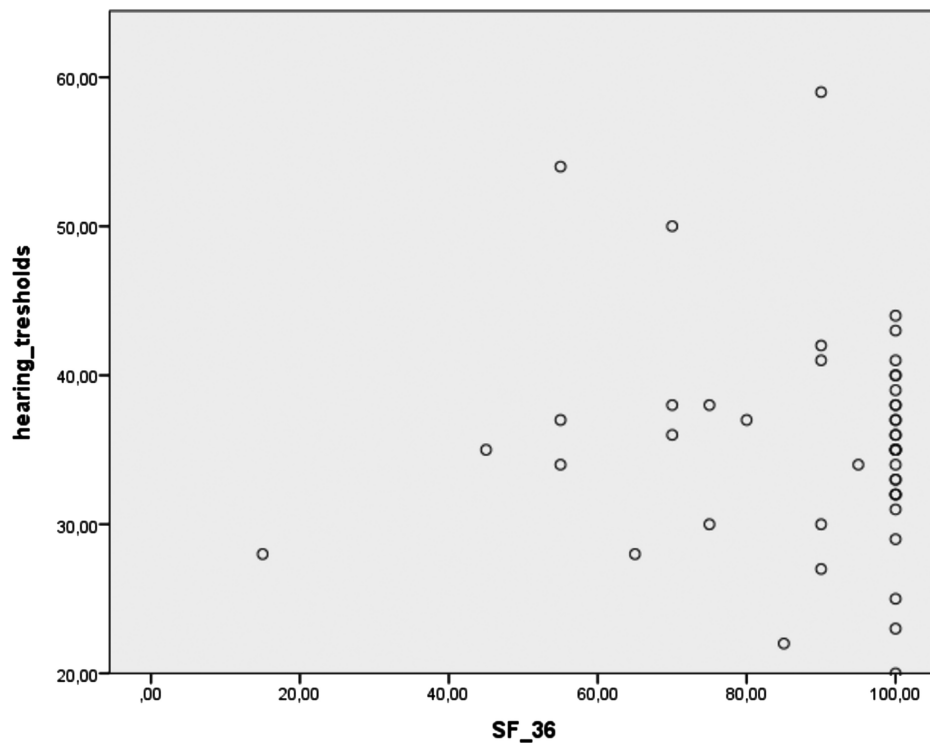


Figure 2. Correlation between hearing thresholds and SF-36 scores. SF-36, Short Form 36.

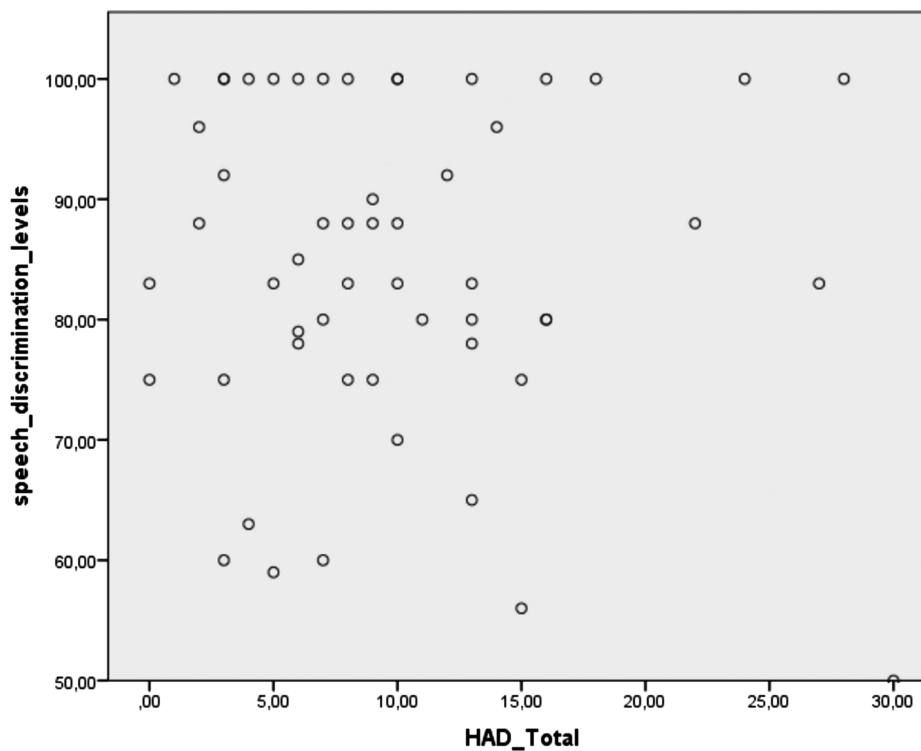


Figure 3. Correlation between speech discrimination level and HAD total scores. HAD, Hospital Anxiety and Depression Scale.

states of patients in the advanced age group, such as anxiety and depression, may come into play, so patients may be more affected. In addition, due to their advanced age, they can lead a more calm and sedentary life. In addition, due to the fact that the younger age group

is more dynamic, more productive and naturally leads a more active life, their expectations may be higher, which can increase the anxiety coefficient. Our study, unlike the literature, is important in terms of presenting earlier age data.

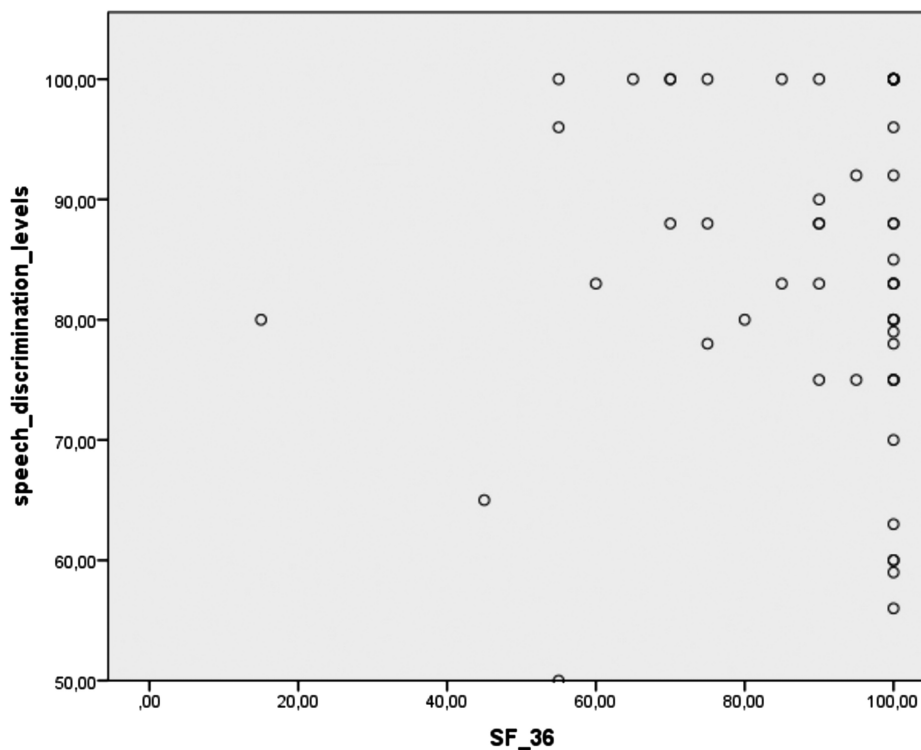


Figure 4. Correlation between speech discrimination level and SF-36 scores. SF-36, Short Form 36.

Table 1. Sociodemographic and Clinical Features

	Study Group (n = 53)	Control Group (n = 52)	P
Age (mean \pm S.D.)	42.88 \pm 18.04	42.13 \pm 16.91	.826
Gender			.915
Female	24 (45%)	23 (44%)	
Male	29(55%)	29 (56%)	
Time elapsed after surgery (month \pm S.D.)	36.15 \pm 22.44	-	
HAD-D	4.03 \pm 3.55	4.69 \pm 2.48	.278
HAD-A	6.28 \pm 4.14	6.65 \pm 3.36	.616
HAD-TOTAL	10.35 \pm 6.82	11.36 \pm 5.03	.392
SF-36			
Physical function	91.69 \pm 11.26	89.71 \pm 13.62	.417
Physical role	81.13 \pm 27.69	67.78 \pm 29.01	.018
Emotional role	81.52 \pm 24.28	77.32 \pm 27.17	.405
Energy vitality	71.98 \pm 15.13	68.07 \pm 13.90	.172
Mental health	81.28 \pm 14.13	78.00 \pm 13.40	.225
Social functioning	80.81 \pm 23.35	81.07 \pm 19.31	.950
Pain	85.22 \pm 25.83	84.97 \pm 22.26	.957
General health	87.73 \pm 18.33	79.32 \pm 16.11	.014

HAD-A, Hospital Anxiety and Depression Scale-Anxiety score; HAD-D, Hospital Anxiety and Depression Scale-Depression score; HAD-TOTAL, Hospital Anxiety and Depression Scale-Total score; SF-36, quality of life scale-Short Form 36.

Bold indicates $P < .005$.

The data of our study revealed that the study and control groups did not differ in terms of HAD-D, HAD-A, and HAD-TOTAL scores. The literature emphasizes that hearing loss may be comorbid with depression and anxiety¹² and that the elimination of hearing loss provides regression in these symptoms.^{13,14} It can be interpreted in a way that patients who have had cochlear implants have similar HAD scores with those who have never experienced hearing loss before, the possible psychiatric symptoms of these patients during the period of hearing loss have improved to control group levels after the surgery. Elimination of the underlying cause is of great importance in the treatment of psychological symptoms due to medical reasons. In this respect, patients whose hearing is restored with the intervention applied show a mental improvement along with their physical well-being. In addition, considering that mental well-being will contribute to the implant use adaptation process, a positive benefit can be mentioned.

When the correlation between the hearing levels of the patients with CI and the HADS and SF-36 scores was examined, a significant negative correlation was found between the hearing level and the SF-36 mental health sub-score. These data show us that while the recovery of hearing has a similar effect in anxiety, depression, and other quality of life domains, there is a significant relationship between the level of hearing and the mental health domain of quality of life.

When we compared the quality of life levels, there was no significant difference between the study group and the control group in physical function, social function, emotional role function, energy vitality, mental health, and pain sub-scores. However, physical role function and general health perception scores were found to be significantly higher in the study group. It is known that hearing loss negatively affects the quality of life, especially due to the inability

to understand speech due to articulation disorder that develops over time secondary to hearing loss, and social isolation caused by hearing difficulties.¹⁵ In a study conducted in Germany in 2012, a significant increase was found in the evaluation of the quality of life after cochlear implantation compared to before.¹⁶ Beyond that, our study also shows that those who have experienced hearing loss and regained their hearing ability by being treated have shown better scores in terms of disability due to physical health problems and general health perception than those who have never had this experience. This data can be interpreted as the recovery of an important function such as hearing, after the loss, raises awareness of the hearing function in subjects.

In our study, no correlation was found between the time passed after surgery and HAD scores and SF-36 scores. In comparisons before and after surgery in various studies, a significant decrease in depression, anxiety, and stress levels¹¹ and an increase in quality of life are mentioned.¹⁷ In an article published by Bergman et al.¹¹ it was stated that 40 patients who were followed up after cochlear implant application had a regression in depression symptoms in the first year compared to the preoperative period, while there was no difference between the third year and the first year. These data can be interpreted as patients with hearing loss regaining their hearing abilities after cochlear implantation, providing psychological improvement and then maintaining it.

This study has some limitations. One of these limitations was the lack of data on the preoperative mental status and quality of life of the sample. Second, other life events that would affect the mental status and quality of life of the sample were not included in the analysis. Lastly, patients underwent only a 1-time evaluation after surgery, not a long-term follow-up.

In conclusion, the fact that the patients evaluated after cochlear implant surgery had similar depression and anxiety levels and quality of life as the controls, and even physical role and being significantly better in general health compared to the controls reveal the importance of regaining hearing ability.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Istanbul Medeniyet University, Prof. Süleyman Yalçın City Hospital (Approval No: 2021/0405).

Informed Consent: Written informed consent was obtained from the participant who participated in the study.

Peer-review: Externally peer-reviewed.

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