

ORIGINAL ARTICLE

Relationship between Quality of Life, Anxiety and Depression in Unilateral Hearing Loss

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Introduction: The aim of this study was to find effects of acquired unilateral hearing impairment on quality of life (QOL), anxiety, and depression in young male patients. This study was performed on military personnel aged 21–30 and healthy apart from their incipient hearing loss.

Materials and Methods: A prospective analysis was performed on 90 patients and 90 healthy individuals who were admitted to the Ear, Nose and Throat Department of Sivas Military Hospital, Turkey between February 2007 and November 2007. A psychiatrist, who employed several questionnaires regarding QOL, Beck Depression, Anxiety Inventory, neuropsychological functions, and affective disorders, additionally examined the patients and the healthy individuals. Ninety patients with unilateral hearing loss worse than 25 dB were included in the present study. Hearing loss was classified as: mild impairment (26–40 dB HL); moderate impairment (41–60 dB HL); severe impairment (61–80 dB HL); profound impairment (including deafness) (81 dB HL or greater).

Results: Hearing impaired patients' QOL levels were significantly worse than the healthy reference groups in terms of physical, social, psychosocial aspects ($p < 0.05$), and their depression anxiety levels were also higher ($p < 0.05$). There were statistical differences between the two groups, but there was no statistical difference between the groups regarding educational background ($p > 0.05$) and median age ($p > 0.05$).

Discussion and Conclusion: The patient group's depression and anxiety levels were higher and their QOL level lower. Although hearing impairment exhibited a negative correlation with the levels of quality of life, anxiety, and depression, it showed no correlation with age, educational background, and level of hearing impairment. The duration of hearing loss was positively correlated with anxiety and depression levels and negatively correlated with QOL scores. The results of this study were compared with other age groups and civilian people of other studies.

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INTRODUCTION

According to the World Health Report, hearing impairment is the most frequent sensory deficit in human populations, affecting more than 250 million people across the world ^[1]. Consequences of hearing impairment include inability to interpret speech sounds, often producing a reduced ability to communicate, a delay in language acquisition, economic and educational disadvantages, social isolation, and stigmatization ^[1]. Despite the presence of the incidence data of congenital hearing loss obtained from newborn hearing screening program by many hospitals in our country, there is no study on the incidence of cases with acquired hearing loss.

Before the 1980's, the major focus of physicians was to cure the patient and/or increase the length of survival. Treatment design was based on disease-

related factors. The patient's nonphysical status was not a priority. After this period, physicians have started to show concern about patients' quality of life (QOL). For this reason, there was an explosion in QOL literature, with more than 30 generic tools (to assess global QOL and health considerations) and more than 300 disease-specific tools ^[2].

Sound localization on a horizontal plane is achieved by bilateral hearing, and in noisy environments, pure tones are heard well. Previously, because patients with unilateral hearing loss had normal hearing in the other ear, their speech and language developments were considered normal. After physicians found out importance of bilateral hearing, patients with unilateral hearing loss who revealed educational and behavioral problems were examined and compared with normal hearing people, ^[3].

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It is well known that chronic diseases, such as hypertension, heart failure, chronic pulmonary disease, and disabilities, such as presbyopia, are seen in elderly people and that they reduce people's QOL and increase depression and anxiety ^[4]. Moreover, numerous studies have been performed to investigate hearing impairment and QOL association, most of which were on children ^[3] and the elderly ^[5, 6]. In the present study, we aimed to investigate the effects of acquired unilateral hearing impairment over QOL, anxiety, and depression among young male patients.

Material And Methods

Ninety adult patients with acquired unilateral hearing loss and ninety healthy individuals were included in the present prospective study. The present study was performed in the Ear, Nose and Throat Department of Sivas Military Hospital Turkey between February 2007 and November 2007.

Before being drafted, all the conscripts were examined as it was mandatory and they had not been previously exposed to loud noise. Volunteers among people with hearing loss were admitted to the study. During the initial examination, a control group was formed from conscripts who were healthy and had no hearing loss in either ear.

A detailed history of the patients with hearing loss was taken. This included: age during which hearing loss started; how it began (slowly or in an acute way); whether it was progressive-intermittent-constant; accompanying symptoms (tinnitus, dizziness, ear fullness, pain); physical, acoustic, or barotraumatic history; history of previous ear surgery; history of ear discharge; history of ototoxic drug use; history of meningitis or syphilis; history of recent air travel or diving; history of hearing aid device use; and presence of any chronic diseases.

Following the detailed history, a comprehensive otolaryngologic examination was performed. Presence of tympanic membrane, middle ear effusion, cholesteatoma, and ossicle chain pathologies were investigated using otoscopic and binocular otomicroscopic examinations. While patients with patent tympanic membrane were subjected to tympanometry and acoustic reflex tests, patients with sensorineural hearing loss were subjected to ABR tests and posterior fossa cranial magnetic resonance imaging scans. ALT, AST, CBC, serum glucose, urea, creatinine, and PA chest x-ray analysis were carried out for all subjects in both the patient and control groups.

Patients aged above 30 and below 20, and cases with bilateral hearing impairment, congenital hearing loss, chronic diseases (diabetes mellitus, lung disease, cardiac disease, stroke, cancer, peripheral artery disease, osteoarthritis, rheumatoid arthritis), suspected history, history of hearing aid usage, and people not aware of their hearing loss until the first examination, were excluded from the study.

Hearing examination included pure tone air-conduction audiometry carried out in a sound-treated room by an otolaryngologist using an Interacoustic AC 33 audiometer (Interacoustics, Denmark). Hearing thresholds at frequencies of 500, 1,000, 2,000, 3,000, and 4,000 Hz were measured. Bone-conduction audiometry was performed. Audiometer calibration was conducted regularly and complied with International Standards Organization Protocol 389.

People who had an air-conduction threshold better than 25 dB in one ear and worse than 25 dB in the other ear were included in the group of patients with hearing loss. Hearing thresholds of all patients were measured and recorded numerically. Hearing loss was classified as: mild impairment (26–40 dB HL); moderate impairment (41–60 dB HL); severe impairment (61–80 dB HL); profound impairment including deafness (81 dB HL or greater).

Using several questionnaires, these patients were additionally examined by a psychiatrist for evaluation of QOL, Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI), neuropsychological functions and affective disorders.

Symptoms and severity of depression were evaluated by using the Turkish version ^[7] of the BDI ^[8]. The BDI is a 21-item self-report questionnaire, where the 21 items correspond to symptoms, such as mood, pessimism, and suicidal ideas. Subjects rate each item on a 4-point scale from 0 (absent) to 3 (severe). The recommended cutoff rate of 17 is used to define depression, while higher scores indicate greater depression. The BDI is an internally consistent and valid measurement ^[8].

The BAI scale consists of 21 items. Each item is rated between zero (never) and 3 (all the time). Increasing scores indicate the severity of the intensity of anxiety symptoms. Possible scores range between 0 and 63. Beck et al. ^[9] developed the BAI, and Ulusoy ^[10] performed the validity and reliability study in Turkey.

The Medical Outcomes Study-36 Item Short Form Health Survey (SF-36) was used to evaluate QOL. The SF-36, developed by Ware et al. [11], assesses eight health concepts: physical functioning (PF); role limitations due to physical problems (RP); social functioning (SF); role limitations due to emotional problems (RE); mental health (MH); vitality (VT); bodily pain (BP); and general health perception (GH). Normalized scores representing overall physical and mental functioning are calculated from the individual scales, and are presented as the physical component scale (PCS) and mental component scale (MCS). The PCS includes the aspects of PF, RP, BP, GH, and VT. The MCS is composed of the SF, RE, MH, GH, and VT. VT and GH are parts of both aspects. All raw scale scores are linearly converted to a result between 0 (worst possible health status or QOL) and 100 (best possible health status or QOL). The score of the subgroups, as well as the final global score of the SF-36, was calculated between 0 (worst possible health state) and 100 (best possible health state) by coding, summing, and transforming its relevant item scores according to the SF-36 manual. Different language versions of the SF-36, including Turkish, are available. Physical and mental component scores were calculated according to previous factor analysis results [11].

Data were stored on a database and analyzed using SPSS 11.5 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for patient demographics, chi-squared test was used to analyze the categorical data, and t-test was used to analyze the parametric

data. In addition, we used Pearson's correlation analysis to determine numerically the relationships between QOL and age, BDI, BAI, and hearing impairment level. Statistical significance was recognized as $p < 0.05$.

Results

The age range for all individuals was between 21 and 30 (mean age 21.72). This study consisted of 180 persons (90 healthy and 90 with a hearing impairment). Table 1 lists the mean age (and age range) of the patients and their sociodemographic features.

Table 2 shows the hearing impairment patient groups; most of them had moderate and severe impairments. The mean duration time between the military health examination and the beginning of the hearing loss was found to be 4.64 ± 2.1 year.

Table 3 shows the BDI, BAI, PSC, and MCS scores of the patient and control groups. The patient group's BDI and BAI scores were higher than the control group's scores, and this difference was significant ($p=0.000$), showing that the patient group was more depressed; moreover, their anxiety status was also worse than the control groups. PCS and MCS scores of the patient group were lower than that of control group and this difference was significant ($p<0.05$), showing that the patients' QOL levels were lower than the control groups QOL levels.

There was no significant correlation between age and hearing impairment level and QOL level. On the other

Table 1. Patient and control groups' educational levels and age

	Patient		Control		
	n	%	n	%	
Educational Level					$p>0.05$
Primary school	45	50.0	39	43.4	
High school	30	33.3	43	47.8	
University	15	16.7	8	8.8	
Age \pm SD	21.23 \pm 1.94		22.21 \pm 2.08		$p>0.05$

Table 2. Classification of hearing impaired patients (mean hearing level 68.76 \pm 26.53 dB worse ear)

	Patient	
	n	%
Grade 1 (Mild impairment) 26-40 dBHL	18	20
Grade 2 (Moderate impairment) 41-60 dBHL	25	27,8
Grade 3 (Severe impairment) 61-80 dBHL	31	34,5
Grade 4 (Profound impairment) 81 dBHL or greater	16	17,7

hand, the BDI and BAI scores were negatively correlated with patients' QOL levels (Table-4). No significant correlation was determined between the BDI ($p>0.05$) and the BAI ($p>0.05$) and hearing level.

Discussion

Hearing impairment is a broad term used to describe the loss of hearing in one or both ears. There are different levels of hearing impairment; hearing impairment refers to complete or partial loss of hearing ability in either ear. Level of impairment can be mild, moderate, severe, or profound; deafness refers to the complete loss of ability to hear in one or both ears.

Adult-onset hearing loss was the second leading cause of Years Lost due to Disability (YLD) on a global level, accounting for 4.6% of total global YLDs. Total global YLD for hearing loss is estimated to be 24.9 million or 4.7% of the total YLD due to all causes. This makes hearing loss the second leading cause of YLD after depression, and gives it a larger non-fatal burden than alcohol-related disorders, osteoarthritis, and schizophrenia [1].

QOL refers to a spectrum of factors that, in total, comprise "well-being", a concept currently being defined. Global well-being includes physical, functional, emotional, and social domains as influenced by a person's beliefs, expectations, and perceptions, and by the patient's education level. But we found no relationship between QOL scores and any of BDI-BAI and median age and educational level.

The most important goal of QOL assessment is to have a cured and intact patient who can assume as near-normal function as possible for the duration of his or her lifetime. An important practical application of studying QOL is identifying patients and/or families who will have, or are having, problems while adapting themselves to their illness and its treatment [2].

Brainerd et al. [12] evaluated the psychometric results of hearing loss and found subjective test (the Denver Scale of Communication Function and the Social Hearing Handicap Index) results more valuable than objective test results. However, because the aforementioned subjective tests have no validity or reliability studies for Turkish, we used the results of an objective test – pure tone audiometry – in the present study.

Numerous studies have been performed on the relationship between hearing impairment and depression, anxiety, and QOL [13-15]. They found that hearing impairment lowers QOL, and increases depression and anxiety. We found the same result. In the present study, this finding was consistent with the literature.

At the Nord-Trøndelag Hearing Loss Study in Norway [16], Tambs found hearing loss to be associated with substantially reduced mental health ratings among some young and middle-aged people, but usually it did not severely affect mental health among older persons. Kramer et al. [17] found that older people with a hearing

Table 3. Comparison of patient and control groups in terms of mean BDI (Beck Depression Inventory), BAI (Beck Anxiety Inventory) and QOL (Quality of Life) scores \pm standard deviation (SD)

	Mean \pm SD		
	Patient (SD)	Control (SD)	p
BDI	21.06 \pm 13.25	7.13 \pm 4.18	<0.01
BAI	19.66 \pm 14.49	5.52 \pm 3.10	<0.01
WHOQOL – Brief (SF-36)			
Physical component scale (PCS)	52.56 \pm 18.04	66.00 \pm 6.92	<0.01
Mental component scale (MCS)	48.40 \pm 24.46	71.56 \pm 10.59	<0.01

Table 4. Relationship of QOL with age, BDI (Beck Depression Inventory), BAI (Beck Anxiety Inventory) and hearing impairment level in patient group

	Physical component scale (PCS)		Mental component scale (MCS)	
	r	P	r	P
Age	0.06	>0.05	0.13	>0.05
BDI	-0.65	<0.01	-0.80	<0.01
BAI	-0.62	<0.01	-0.58	<0.01
Hearing Impairment Level	0.21	>0.05	0.13	>0.05

impairment showed significantly more depressive symptoms, lower self-efficacy and proficiency, higher feeling of loneliness, and a smaller social network than their peers with normal hearing did. We found that younger patients with hearing impairment had lower QOL scores and higher BDI-BAI scores than people with normal hearing levels. This current study was performed on otherwise healthy males between 21 and 30 years of age. We endeavored to control the other negative factors affecting QOL, but it must not be taken that these cases in the military environment were able to affect the QOL negatively. The control group was selected from the same social environment and the possible effects on the results that the cases were only located in the military service were eliminated.

Hallam et al.^[18] performed a study on 122 patients and found that psychosocial needs of people with acquired profound hearing loss are not being recognized or met, and that this is probably true cross-nationally. The emotional impact of acquired profound hearing loss may not be that much greater, on average, than in moderate to severe acquired hearing loss. But we found no statistical relationships between QOL and any of hearing impairment level, depression and anxiety. Elevation in hearing impairment level was not accompanied by a psychosocial impact increase. Our cases were young adults and their duration of hearing loss was short. Duration of illness was positively correlated with anxiety and depression levels, and negatively correlated with QOL scores.

Low QOL scores, high anxiety and depression levels are observed in patients with unilateral hearing loss due to factors such as: difficulty in accomplishing daily activities; weak environmental support; a sense of incompleteness; requirement to constant medical monitorization; and exclusion from certain jobs in our country (police, professional soldier). Patients' expectations, beliefs, acknowledgement of disease, and level of knowledge on his /her condition affect QOL, BDI, and BAI. The absence of a significant correlation between QOL and hearing loss levels may be explained by the presence of individual differences. The Blue Mountain Hearing Study^[19] revealed that people with a unilateral hearing impairment did not have significantly different SF-36 scores compared to those without measured hearing loss; we found the SF-36 scores of unilateral hearing loss patients worse than those of normal people.

Lieu^[3] reviewed the current literature about the impact of unilateral hearing loss in children on the development of speech and language and educational achievement, and found that children with unilateral hearing loss appear to have an increased rate of grade failures, need for additional educational assistance, and perceived behavioral issues in the classroom. While speech and language development showed a delay in several children, they were able to catch their peers in the end, and Lieu could not explain this improvement. In the present study, the speech and language development in patients with unilateral hearing loss was found to be normal without any behavioral issues. No difference was determined regarding educational backgrounds when compared to the control group. This may be explained by the fact that hearing loss did not start during childhood.

Conclusion

While unilateral hearing loss decreases QOL levels and increases BDI-BAI levels among young male patients, no significant statistical correlation was determined between the level of hearing loss and QOL, BDI, and BAI levels. This result may be explained by the differences among patients in beliefs, expectations, acknowledgement of disease, and level of knowledge on his/her condition. The duration of hearing loss was positively correlated with anxiety and depression levels and negatively correlated with QOL scores. Because subjective tests had a better correlation with psychometric test results compared to objective hearing tests, further analysis could use subjective tests with verified validity and reliability rates. It was thought that the result of this study could be compared with other age groups and civilians in later studies.

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