

# Affective Disorders and General Health Status in Patients with Total Laryngectomy

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## ABSTRACT

**Introduction:** Total laryngectomy (TL) is a procedure that severely affects the patient's quality of life. This study determined the prevalence of general health and affective disorders as an often neglected aspect of cancer care in patients following TL.

**Methods:** This is a cross-sectional case-control study. We enrolled 80 participants into two groups; male patients who had undergone TL due to advanced squamous cell laryngeal cancer from 1 to 3 years ago (n=45) and a control group of healthy individuals (n=35). The DASS-21 and SF-36 questionnaires were used to evaluate participants' affective disorders and general health, respectively. Data were analyzed using SPSS, and a p-value <0.05 was considered significant.

**Results:** The mean age of the patients and control group were  $57.9 \pm 7.7$  and  $55.4 \pm 8.7$  years, respectively ( $p=0.338$ ). The mean scores of general health status were significantly lower in TL patients than in the control group ( $84.9 \pm 13.1$  vs.  $94.9 \pm 8.4$ , respectively,  $p=0.011$ ), and the mean scores of overall affective disorders were higher in TL patients than in the control group ( $40.8 \pm 25.1$  vs.  $26.7 \pm 19.0$ , respectively,  $p=0.009$ ). Also, we found a significant positive relationship between the prevalence of affective disorders and patients' age ( $r=0.46$ ,  $p=0.004$ ). But there was no correlation between other demographic variables, affective disorders, and general health status.

**Conclusions:** Significant high status of depression and anxiety and lower general health state were seen in TL patients compared with the control group. To enhance patients' quality of life, supporting patients before and after surgery is recommended.

## **1. Introduction**

Total laryngectomy (TL) is a radical procedure that involves removing the whole larynx. This procedure is helpful in the treatment of different advanced types of laryngeal cancer. This treatment is also performed when other conservative therapies such as chemo radiation fail to control the tumor. (Brook, 2009; Nocini et al., 2020; Ward & van As-Brooks, 2014)

TL may have various adverse effects on quality of life (QOL), including speech problems, dysphagia, social isolation, diet limitations, impaired smell and taste, decreased self-esteem, and impaired sexual function. (Genden et al., 2007; Hebel et al., 2014; Hinni & Crujido, 2013; Moreno et al., 2012; Perry et al., 2015; Sadoughi, 2015; Ward & van As-Brooks, 2014; Wulff et al., 2022) People who have undergone TL be more prone to depression and anxiety and often experience a decrease in their general health status. (Jing et al., 2014; Wiegand, 2016)

A recent systematic review investigating the health-related QOL after laryngectomy identified numerous studies on the subject but concluded that the strength of evidence was weak as many studies had a small sample size and were of poor quality. (Wulff et al., 2021) In addition, only a few studies have investigated the late effects associated with affective disorders and health status following TL.

In a large cohort of head and neck cancer patients, anxiety and other mood disorders have been identified as significant psychosocial problems both at baseline and after the completion of therapy. (Murphy et al., 2007) Prevalence rates of psychiatric illness were diagnosed among 17.3% of the partial laryngectomy patients and 22.2% of the TL patients. (Bussian et al., 2010) According to previous studies, 2-6% are related to anxiety disorder and phobia. (Singer et al., 2005, 2007)

The primary aim of this study was to determine the patient-reported health status and the prevalence of depression, anxiety, and stress disorders after TL.

## **2. Materials and Methods**

### **2.1 Participants and sampling**

Compared to the control group, this cross-sectional and descriptive study was conducted to assess the QOL and negative emotional state (depression, anxiety, and stress) among TL patients. This study was performed in a tertiary referral center from January to April 2021. Required sample size calculated with a precision of 5% and confidence interval level of 95%. We considered male patients who underwent total laryngectomy due to laryngeal cancer from 1 to 3 years ago as an inclusion criterion. Patients with any disorder or underlying diseases that caused negative emotional states or affected the QOL and unwillingness to cooperate were excluded.

### **2.2 Ethical considerations**

The study was done in accordance with the Declaration of Helsinki and approved by the local ethics committee. At the beginning of the study, informed consent was obtained from all participants.

### **2.3 Measurement tool**

The demographic information, including personal details and history, take by the related gathering datasheet.

## **2.4 General health status**

We used a validated Persian version of the Short Form 36-Item Health Survey (SF-36) questionnaire for measuring the health-related QOL, (Montazeri et al., 2006; Ware Jr, 2000) which is divided into eight domains: physical functioning (PF), role limitations due to physical health (RP), role limitations due to emotional problems (RE), vitality (VT), mental health (MH), social functioning (SF), body pain (BP), general health (GH), (Instrument Ware Jr & Sherbourne, 1992) A higher score (range between 0-100) indicates better function.

## **2.5 Affective disorders state**

Affective states were evaluated using the validated Persian form of depression, anxiety, and stress scale (DASS-21), a set of three self-report scales designed to measure the affective states of depression, anxiety, and stress. (Sahebi et al., 2005) Each of the three DASS-21 scales contains seven items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic nonspecific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient. Scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items. (Lovibond & Lovibond, 1995) Patients were asked to score items on a scale from 0 (did not apply to me at all) to 3 (used to me very much). Sum scores were computed by adding up the items per (sub) scale scores and multiplying them by 2. Sum scores for the total DASS-total scale thus range between 0 and 126, and those for each of the subscales may vary between 0 and 42; scores 60 (for DASS total) and 21 (for the depression subscale) were labeled as "high" or "severe". (Beaufort et al., 2017)

## **2.6 Statistical analysis**

Statistical Package performed the statistical analysis for Social Sciences version 20 (SPSS Inc, Chicago, IL, USA). The results of continuous variables were presented by mean  $\pm$  SD, and those related to the quantitative or categorical data were shown by frequency and percentage. Qualitative data analysis was performed by chi-square or Fisher exact test. The Pearson correlation coefficient was also employed to determine the relationship between two quantitative variables. An Independent two-sample t-test was used to compare the means. P-value  $<0.05$  was considered significant.

# **3. Results**

## **3.1 Participant Baseline Characteristics**

We gathered 80 participants with a mean age of  $54.6 \pm 8.9$ . All participants were men and were divided into patients ( $n=45$ ) and the control group ( $n=35$ ). All patients underwent TL  $2.2 \pm 1.6$  years ago. The mean age in the patient and control group was  $57.9 \pm 7.7$  and  $55.4 \pm 8.7$  years, respectively, and there was no significant difference in the mean age and other demographic data between the two groups ( $p > 0.05$ ). As shown in Table 1, there was no significant difference in the baseline data between the two groups at the beginning of the study ( $p > 0.05$ ).

Table1: Distribution of the baseline characteristics of our studied groups.

Characteristics	Studied Groups, N=80		
	Control n=35	Patients n=45	p-value
Age, (year), Mean±SD	55.4±8.7	57.9±7.7	0.338
Marital status, (Married), n (%)	34(97.1)	43(95.6)	1.000
Level of education, n (%)			
Till diploma	13(37.2)	20(44.4)	0.073
Associate degree	16(45.7)	18(40.0)	
Bachelor and higher	6(17.1)	7(15.6)	
Occupation, n (%)			
Unemployed	2(5.7)	8(17.8)	0.452
Self-employed	23(65.7)	25(55.6)	
Employee	10(28.6)	12(26.6)	

### 3.2 General health status

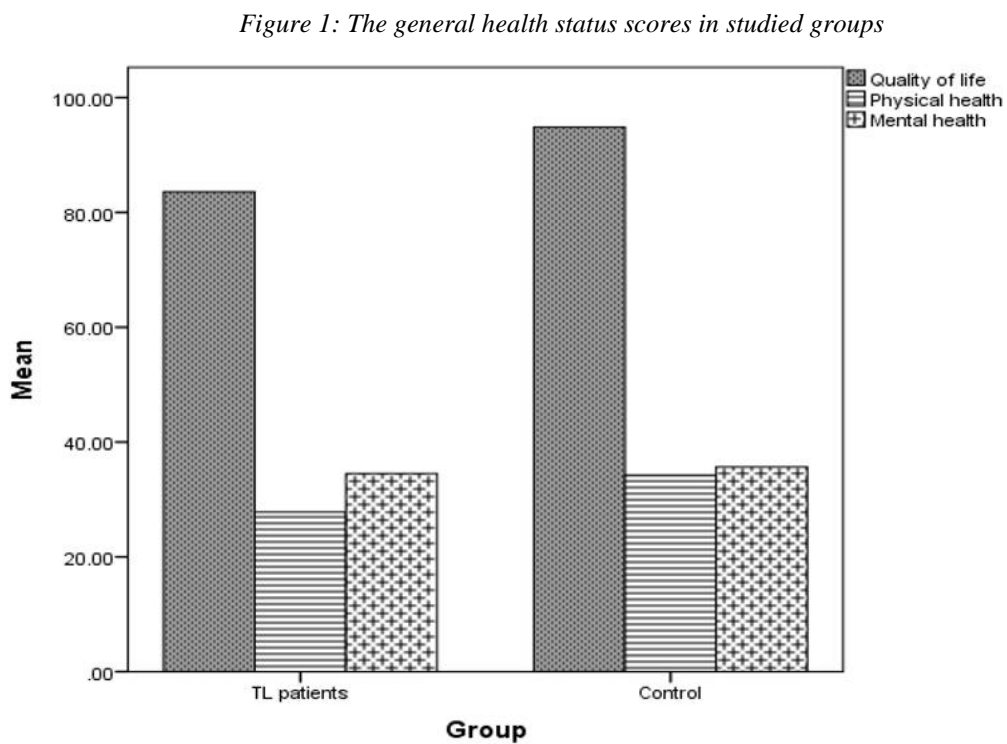
The mean general health status scores were lower (worse) in patients than in the control group (84.9±13.1 vs. 94.9±8.4, p=0.011, Table 2, Graph 1). TL patients had significantly lower physical health levels than the controls (27.7±10.7 vs. 34.2±3.9, p=0.010). And also, the assessing system of eight domains showed that TL patients had significantly poorer physical, social, and role physical functions and bodily pain (p<0.05)

Table 2: Distribution of the quality of life level among studied groups

Quality of life(SF36)	Studied Groups, N=80		
	Control n=35	Patients n=45	p-value
Total score of quality of life	94.9±8.4	84.9±13.1	0.011
Major domains of quality of life*			
Physical health	34.2±3.9	27.7±10.7	0.010
Mental health	35.6±5.8	34.5±3.6	0.511
Eight domains of quality of life*			
Physical function (PF)	27.4±2.6	22.4±2.6	0.012
General health (GH)	16.4±2.1	15.9±1.4	0.433

Role physical (RP)	3.5±1.2	2.3±1.9	0.042
Role emotional (RE)	1.9±1.4	2.0±1.4	0.866
Social function (SF)	3.2±1.1	2.7±0.6	0.050
Bodily pain (BP)	8.2±1.8	5.6±2.2	0.001
Vitality (VT)	12.7±2.5	12.3±1.5	0.514
Mental health (MH)	14.5±2.8	14.7±2.4	0.784

\*: Different domains of quality of life-based on various grouping systems.



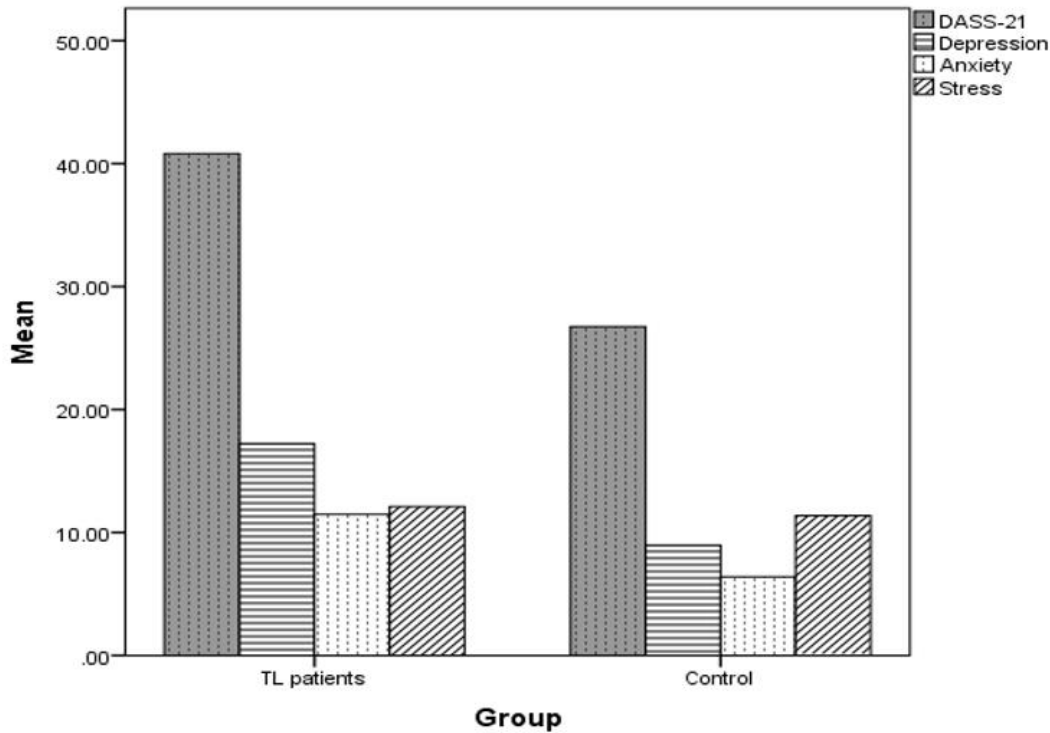
### 3.3 Affective disorders states

The mean scores of overall affective statuses were higher (worse) in patients than in the control group (40.8±25.1 vs. 26.7±19.0, respectively, Table 3, Graph 2). This difference is statistically significant (p=0.009). And also, different affective domains were worse among the patients group. However, only the depression and anxiety scores were significant statistically (p<0.0001 and 0.026, respectively).

*Table 3: Distribution the emotional distress level among studied groups.*

Emotional distress (DASS-21)	Studied Groups, N=80		
	Control n=35	Patients n=45	p- value
Overall emotional distress	26.7±19.0	40.8±25.1	0.009
Depression score	9.5±8.1	17.3±9.0	0.000
Normal	20(57.1)	9(22.5)	1 0.004
Mild to moderate	12(34.3)	19(47.5)	
Severe to extremely severe	3(8.6)	12(30.0)	
Missing	0(0.0)	5(11.1)	
Anxiety score	6.4±5.3	12.2±4.3	0.026
Normal	22(62.9)	16(40.0)	0.040
Mild to moderate	9(25.7)	13(32.5)	
Severe to extremely severe	4(11.4)	11(27.5)	
Missing	0(0.0)	5(11.1)	
Stress score	13.3±8.1	16.2±9.9	0.694
Normal	23(65.7)	26(66.7)	0.543
Mild to moderate	9(25.7)	7(17.9)	
Severe to extremely severe	3(8.6)	6(15.4)	
Missing	0(0.0)	6(13.3)	

*Figure 2: The affective status scores in studied groups*



### 3.4 Depression

The mean score of depression in the control group was  $9.5 \pm 8.1$ , significantly lower than in patients ( $17.3 \pm 9.0$ ,  $p < 0.001$ ). As it is presented in Table 3, 15 participants (42.9%) in the control group and 31 patients (77.5%) had mild to extremely severe symptoms of depression, whereas

20 participants (57.1%) in the control group and nine patients (22.5%) had normal range of depression ( $p = 0.004$ ).

### 3.5 Anxiety

The total mean anxiety score in the control group was  $6.4 \pm 5.3$ , significantly lower than in the patients ( $12.2 \pm 4.3$ ,  $p = 0.026$ ). As it is presented in Table 3, 13 participants (37.1%) in the control group and 24 patients (60%) had mild to extremely severe symptoms of anxiety, whereas 22 participants (62.9%) in the control group and 16 patients (40.0%) had normal range of anxiety ( $p = 0.040$ ).

### 3.6 Stress

The control group's total mean stress score was  $13.3 \pm 8.1$ , which was not significantly lower than the patients ( $16.2 \pm 9.9$ ,  $p = 0.694$ ). As it is presented in table 3, 12 participants (34.3%) in the control group and 13 patients (33.3%) had mild to extremely severe symptoms of stress, whereas 23 participants (65.7%) in the control group and 26 patients (66.7%) were in the normal range of stress ( $p = 0.543$ ).

### 3.7 Correlations

There was a reverse correlation between general health and affective states in both groups ( $r = -0.40$ ,  $p = 0.049$  in the TL patients group and  $r = -0.69$ ,  $p = 0.010$  in the control group). Also, we found a

positive relationship between emotional distress level and age factor in the patient's group ( $r=0.46$ ,  $p=0.004$ ). But we did not find any correlation between other demographic variables and general health and affective states ( $p=0.543$ ).

*Table 4: Correlation of our variables in our studied groups.*

Correlation (p-value)	Age	Emotional distress
Quality of life		
Patient group	-0.02 (0.923)	-0.4(0.049)
Control group	-0.07 (0.740)	-0.69(0.010)
Emotional distress		
Patient group	0.46 (0.004)	-
Control group	0.09(0.624)	-

#### 4. Discussion

TL is a radical procedure that impacts several aspects of patients' QOL such as speech, swallowing, smell, taste, and psychological problems. This study revealed that TL enhances affective disorders and reduces general health in patients undergoing the procedure. Our study also showed a positive relationship between affective disorders and age in total laryngectomy patients.

The average demographic characteristics of the patients were in line with the features of the TL patients in other studies. (Danker et al., 2010; Leemans et al., 2020) According to the survey of a large sample of TLs respondents, about 80% were aged more than 60 years, 60% were retired, and a male-to-female ratio of 5 was reported.<sup>24</sup>

Speech, social interactions, swallowing, sense of smell and taste, and respiration will dramatically deteriorate after the TL and lead to a lower QOL and limitation of social activities.(Danker et al., 2010) According to the systematic review of 46 articles evaluating the QOL after TL, five studies applying the SF-36 found that people who undergo TL have poorer general health than the average population.(Jing et al., 2014)

In the current study, the SF-36 questionnaire was used to assess the level of general health in eight significant domains. Role emotional (RE) had the lowest mean degree (mean:2). In contrast, physical function (PF) had the most effective score among other fields (mean:22), which was significantly lower than the control group, and the mean scores of total general health were significantly lower (worse) in patients in comparison to control group. According to the study by Schindler et al. evaluating SF-36 scores on 48 patients undergoing TL, the median range of SF-36 main domains was higher than ours, ranging from 41 in the bodily pain (BP) domain to 100 in RE and RP domains. (Schindler et al., 2013) This difference from our results may be due to the lack of information about psychological rehabilitation programs after TL. (Jing et al., 2014)

In another study assessing the effect of voice prosthesis rehabilitation after TL according to the SF-36 questionnaire, the mean degree of main domains was higher than ours ranging from 25 to 67. These results indicate that voice prosthesis and other conservative methods that preserve the voice would improve patients' general health status and restrict social embarrassment. (Giordano et al., 2011)



The issue of voice loss causes serious communication problems in the family and work environment for the patients. As a result, the sense of self-worth in the patients decreases and causes them to become more isolated. (Dinescu et al., 2016) Accordingly, TL can affect patients' self-image and mild to severe anxiety and depression. (Cox et al., 2015) In our study, by applying the DASS-21, the mean scores of overall affective disorders were significantly worse in patients than in the control group, especially in depression and anxiety domains. More than 77% of the patients have experienced mild to extremely severe depression after the laryngectomy procedure. Moreover, about 60% developed mild to extremely severe anxiety, and more than 30 percent of patients reported some degrees of stress after the TL. We also found a significant positive relationship between affective states and age. However, there was no correlation between

other demographic variables and affective and general health status. Previous studies reported the prevalence of depression in post-laryngectomy patients between 16-33%. Clinical anxiety symptoms were also reported in 20 to 33% of patients. (Jing et al., 2014; Kemps et al., 2020) These psychological symptoms of anxiety, depression, and stress had a higher impact on health-related QOL than speech and swallowing dysfunctions. (Perry et al., 2015) Few studies have been conducted on affective disorders and health status evaluation using SF-36 in TL patients, which is considered this study's strength.

## **5. Conclusion**

TL is a radical procedure that seriously impacts the QOL in patients. The present study findings showed the presence of clinically significant affective disorders of depression, anxiety, and stress among TL patients. A positive correlation between affective disorders and the age of patients was also found. Moreover, the general health status was significantly lower in patients than in controls. So, it is recommended to monitor TL patients regarding their participation in social groups, meaningful activities, and vocal issues after the surgery. This approach should also begin before TL to enhance their QOL. Hence, long-term cohort studies should be performed to evaluate the patient's QOL and other associated factors.

## **Limitation**

One limitation of this study is that we did not have the psychological background of the patients for comparison. Although we had a matched control group, we think it is not a significant study concern. Another limitation of our study is that the exact type of patient's occupation was not defined. Our study has examined the overall affective and general health status without considering patients' jobs. The QOL of teachers, reporters, tour leaders, and other occupations that need more advanced speaking abilities would suffer more damage. Nevertheless, it seems that patients' jobs make changes in the range found but do not affect the overall conclusion of the study. The findings of this study can be used as baseline data for future studies with longer follow-ups and in more oncology centers.

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### **Ethics statement**

At the beginning of the study, informed consent was obtained from all participants. The local ethics committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1400.563) approved it.

### **Conflict of interest**

No conflict of interest.

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