



The Potential Effect of COVID-19 Lockdown Period on Tinnitus-related Distress

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ABSTRACT

Objective: To determine the tinnitus severity and quality of life of patients with tinnitus followed before and during the COVID-19 lockdown period.

Materials and Methods: Tinnitus-related distress and quality of life were assessed before and during the COVID-19 lockdown period. The primary outcome was the mean change on the Tinnitus Handicap Inventory (THI), the Mini-tinnitus Questionnaire (TQ 12-T), and the Short-form Health Survey (SF-36). Besides, all participants filled out an evaluation form, underwent audiological assessment, tinnitus mapping, and were administered mini-interviews regarding their tinnitus.

Results: We recruited 44 patients with tinnitus (22 females and 22 males, mean age: 50.25±14.51 years). Comparison of changes in mean score from baseline to the lockdown period showed no differences in overall outcomes for THI and TQ 12-T. Catastrophic (p=0.002), physical pain (p=0.020), and general health (p=0.046) subscales were found to be significantly improved. Only emotional subscales (p<0.001) of THI were found to be significantly increased.

Conclusion: Although the COVID-19 lockdown period for patients with tinnitus is a major source of stress, they did not show any increase in their tinnitus-related distress, except for the emotional state.

Keywords: Tinnitus, COVID-19, lockdown, THI, mini TQ, SF 36

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), which emerged in Wuhan, China in December 2019, has quickly become a global health problem. COVID-19 caused the largest outbreak of atypical pneumonia (SARS) since 2003 due to severe acute respiratory syndrome (1, 2). It is an infectious respiratory disease caused by the severe acute respiratory syndrome coronavirus (SARS-CoV-2) (3, 4). The first COVID-19 case in Türkiye was declared on March 11, 2020 (5). It was stated on March 16, 2020, that various restrictions were gradually introduced by the government in Türkiye to prevent the transmission of Covid-19. From May 17, 2021, to June 1, 2021, a gradual normalization period was started, and the curfew was completely lifted in July (6, 7).

Traumatic situations resulting in the death of unknown origins, such as COVID-19, can lead to a decreased sense of security and deterioration of mental health. Deterioration of mental health may result from the general lack of information about the treatment methods, the fact that it is not yet possible to answer the questions about the disease (such as when the pandemic will end), exposure to information about the effects of the disease, decreased social relations and increased stay at home due to pandemic. It has been observed that the frequency of psychological reactions such as anxiety, depression, fear, anger, stress, and sleep disorders has increased among the general population because of the uncertain and sudden spread of the COVID-19 pandemic (8).

There is a complex and strong interaction between psychological reactions and tinnitus (9). Although emotional effects are seen in one-fifth of the individuals with tinnitus, it has been reported that only 0.5% of them cause disruptions in their daily lives (10). In most of these patients, psychiatric symptoms such as subjective distress, anxiety, depression, concentration disturbance, and sleep disturbance are often accompanied by tinnitus, and these symptoms not only increase the severity of tinnitus but also increase the risk of suicide (11). Most of the patients who had tinnitus during their stay at home stated that they were concerned about the increase in tinnitus because of the limitations and not being able to visit the hospital.

It has been reported in two different studies that with the loosening of the lockdown period, there has been an increase in the number of patients visiting ENT clinics (12, 13). However, it was not stated whether this effect was observed in patients who had previously undergone tinnitus rehabilitation. It has been revealed in the literature that there may be an increase in tinnitus distress during the pandemic. However, the distress factors associated with tinnitus during the pandemic have not yet been fully clarified.

Patients with tinnitus are at a high risk of depression (odds ratio [OR], 1.27) and anxiety (OR, 1.11) symptoms (14). Approximately 75% of new patients with tinnitus attribute emotional pressure as a triggering factor rather than ear problems (15). Therefore, it can be hypothesized that the lockdown period as a stress-inducing factor leads to increased tinnitus-related distress and reduced quality of life in patients with tinnitus. However, the condition of patients who had already undergone tinnitus treatment remains unclear. In this study, we aimed to determine whether tinnitus severity and quality of life changed during the pandemic in patients with tinnitus followed up before COVID-19.

MATERIALS and METHODS

This study was approved by the Institutional Review Board of Ankara Yıldırım Beyazıt University (Ethics Committee no: 2020/55). Participation was voluntary and study participants were given no incentive or reward for their participation.

Participants and Study Design

The records of the patients suffering from tinnitus who were presented to the Audiology Unit at the University of Hacettepe between 1 January to 31 December 2020 were scanned for the study. Our research is a cross-sectional study. All participants completed an evaluation form, underwent an audiological assessment, and a tinnitus mapping was applied, and questionnaires and mini-interviews regarding their tinnitus were administered as a part of the routine evaluation in clinical practice. The age, sex, location, and duration of tinnitus were recorded in the evaluation form, and the clinician verbally instructed the participants and asked them to identify similar frequencies between the binary stimuli and their tinnitus form. The time between the first (pre-lockdown) and second evaluations ranges from 2 to 4 months.

Tinnitus pitch was marked as low, middle, high, and very high frequency below 500 Hz, between 500 Hz to 2 kHz, between 2 kHz to 8 kHz, and above 8 kHz, respectively.

Except for the audiological evaluation, almost all of the study's data collection tools were reassessed via Google forms during the COVID-19 pandemic lockdown period, the peak stress period of the outbreak.

Audiological Evaluation and Tinnitus Mapping

Each participant received an initial audiological evaluation during their clinical visit, which included hearing thresholds at audiometric frequencies (250 to 14,000 Hz), speech audiometry, and immittance measurements. To evaluate the patients' hearing abilities, pure tone threshold averages were calculated at 500, 1,000, 2,000, and 4,000 Hz according to the classification of Clark JG (16).

Immittancemetry was performed using a 226-Hz probe tone emitted by a GSI Tymptstar tympanometer (Grason-Stadler, Eden Prairie, MN). The Jerger (1970) classification was used to define middle ear pathologies (17).

The location of the tinnitus was determined using the evaluation form, before tinnitus mapping. If the tinnitus was unilaterally matching, tones were transmitted from the contralateral ear. If the tinnitus was bilateral or in the head matching, it was given from the ipsilateral ear. The identical frequency was determined gradually

through a selection of two different stimuli, narrow-band noises or different broadband noises. The testing protocol begins with tone presentations at 1,000 Hz. The testing proceeds in ascending 1,000 Hz steps to gradually approach the test frequency closest to the patient's perceived tinnitus pitch.

Questionnaires and Scoring

The questionnaires used in this study were the Tinnitus Handicap Inventory (THI) (18), the Mini-tinnitus Questionnaire (TQ 12-T) (19), and the Quality of Life (QoL) assessments (Short-Form Health Survey [SF-36] (20)). Therefore, we aimed to determine emotional, cognitive, sleep disturbance and functional distress as well as vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, and mental health related to tinnitus. Item scores for each category of the SF-36 questionnaire were coded, summed, and converted into a scale from 0 (worst) to 100 (best) according to the standard SF-36 scoring algorithms. For the TQ 12-T questionnaire, participants marked their distress level according to a three-point Likert Scale as "True", "Partly True", or "Not True" and their responses were scored as 0 points (Not True), 1 point (Partly True), and 2 points. The total score ranged from 0 to 24 points. For THI, the participants marked their distress level using a three-point Likert Scale as "Yes", "Sometimes", or "No", and their responses were scored as 4, 2, and 0 points, respectively. The total score ranged from 0 to 100 points.

The composite scores of the TQ 12-T, the composite and three subscale scores (emotional, functional, and catastrophic) of the THI, and the scores of the eight sections of the SF-36 questionnaire were included in the statistical analyses.

Statistical Analysis

Normative distributions, descriptive analyses, and statistical comparisons were conducted using IBM SPSS Statistics software version 23 (IBM® Corp., Armonk, NY). Since the variables generally were normally distributed, mean and standard deviations were used to summarize the descriptive analysis. The paired sample t-test was used to compare the findings for the questionnaires before and during the lockdown. Wilcoxon test was used for non parametric variables including THI functional, catastrophic, body role function and emotional role function subscales. All analyses were examined using a two-tailed test with an alpha level set at <0.05.

RESULTS

The records of 112 patients were scanned and 68 patients were excluded because of internet connection problems (n=8), inability to use the internet (n=13), failure to follow the recommended therapy (n=26), total recovery (n=14,) or declining without any reason (n=7) of tinnitus. A total of 44 participants (22 men, 22 women) aged 25 to 73 years (average: 50.25±14.51 years) were included. The demographic and clinical characteristics of the participants are presented in Table 1. All patients underwent counseling and various therapies for tinnitus such as the use of sound generators, hearing aids, and combine hearing devices were applied depending upon the tinnitus severity and hearing performance. There were no statistically significant differences between males and females in terms of the THI, TQ 12-T, and SF-36 both before and during the COVID-19 period.

Table 1. Clinical characteristics of the participants

	n	%
Gender		
Male	22	50
Female	22	50
Age		
Male	50.68 (±14.6)	
Female	49.82 (±14.7)	
Hearing loss degree		
Normal	12	27.3
Slight	8	18.2
Mild	6	13.6
Moderate	8	18.2
Moderately-severe	5	11.4
Severe	0	0
Profound	1	2.3
SSD	4	9.1
Tinnitus duration, mean (years)	6 (±6.73)	
Tinnitus location		
Right	6	13.6
Left	13	29.5
Both ears	21	47.7
Head	3	6.8
Missing	1	2.3
Tinnitus pitch		
Low	3	6.8
Medium	8	18.2
High	24	54.5
Very high	5	11.4
Missing	4	9.1
Pulsatile tinnitus		
Yes	0	0
No	44	100

*: SSD: Single-sided deafness

However, the emotional subscales of the THI were significantly increased during the COVID-19 lockdown period ($p < 0.01$) (Fig. 1). The findings of the catastrophic subscales were significantly better during the lockdown period than the initial evaluation before the outbreak ($p < 0.01$). There were no statistically significant differences between the first (pre-lockdown) and second evaluations (during lockdown) of THI, TQ 12-T, and SF-36 ($p > 0.05$) (Table 2).

Two categories of SF-36, namely general health and physical pain, showed statistically significant improvement ($p < 0.05$), whereas six categories remained unchanged ($p > 0.05$) from the first to the second evaluation. Comparing the results with the country-specific normative data, patients with tinnitus had much worse outcomes in all categories (Table 3).

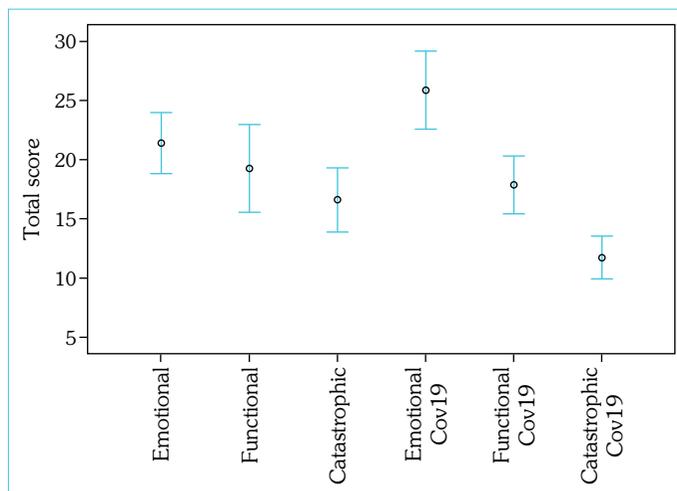


Figure 1. Error bar graphics for patients with tinnitus before and during the COVID-19 lockdown period

DISCUSSION

In this study, we investigated tinnitus severity and QoL during the COVID-19 pandemic lockdown in patients with tinnitus who have been followed up in our audiology clinic since 2019.

In both the THI and TQ 12-T surveys, no statistically significant increase in tinnitus intensity was observed during the lockdown. Although there was a decrease in tinnitus intensity in most patients (82%), an increase in tinnitus was observed in a few individuals (mild to moderate in two cases, moderate to severe in six cases). This increase in the intensity of tinnitus is consistent with the findings reported by Anzivino et al. (12); however, the majority of patients with increased tinnitus severity were those who stated that they did not comply with the recommended therapies. The fear of the disease while staying at home may have caused an increase in the severity of tinnitus in some participants; however, it was an important factor in the tinnitus improvement for a small minority. In addition, therapies administered by us led to improvement in the QoL and decreased tinnitus severity in several patients during the pandemic lockdown period.

An increase in the emotional subscale of THI along with the duration of the COVID-19 pandemic lockdown was consistent with the main hypothesis of this investigation. Usually, strategies for coping with tinnitus include social and physical activities aimed at regulating stress and emotions, as well as avoiding tinnitus noise (21). Failure to perform such social and physical activities during the lockdown may have led to an increase in the emotional perception of tinnitus. According to the information obtained from the patients, it was thought that the increase in the emotional perception of tinnitus might be related to individual economic changes during the pandemic, increased child care and home responsibilities, deterioration in the QoL, and fear of contracting the disease. In our study, the catastrophic subscale of THI was lower than that observed before the lockdown. In addition, an improvement in the overall QoL of the individuals was observed. Thus, unlike other studies conducted on individuals with tinnitus during the pandemic, our study revealed the importance of masking therapy and guidance during this period. It also showed that even though the sever-

Table 2. Results of the tinnitus questionnaires in participants with tinnitus

Before lockdown	During lockdown		During lockdown		p
	Mean±SD	Minimum–Maximum	Mean±SD	Minimum–Maximum	
		(n=44)		(n=44)	
TQ 12-T	13.43±5.69	2.00–24.00	13.00±5.88	0.00–24.00	0.429
THI	57.06±20.29	22.00–96.00	55.25±21.64	12.00–96.00	0.580
THI Emotional	21.39±8.34	6.00–36.00	25.86±10.63	6.00–48.00	0.001**
THI Functional	19.25±12.03	0.00–44.00	17.86±7.89	4.00–32.00	0.571
THI Catastrophic	16.60±8.74	2.00–40.00	11.72±5.81	0.00–26.00	0.007**

*: p<0.05; **: p<0.01

Table 3. Results of the QoL Questionnaire in participants with tinnitus and normative data

	Before lockdown	During lockdown	Country-specific normative data	p
	Mean±SD (n=44)	Mean±SD (n=44)	Mean±SD	
Physical health	71.93±32.78	80.56±19.86	83.80±20.0	0.112
Body role function	63.18±39.10	67.04±39.53	86.3±24.9	0.581
Physical pain	69.37±22.80	79.82±24.44	82.9±18.9	0.041*
General health	51.93±15.55	60.05±22.23	71.6±16.1	0.020*
Energy	51.02±17.13	52.98±20.23	64.5±12.9	0.538
Social function	68.18±20.96	76.76±19.96	91.0±12.9	0.069
Emotional role function	58.74±40.92	57.57±36.21	90.1±19.4	0.874
Mental health	58.81±18.06	60.34±19.15	71.0±11.0	0.598

Comparison of values before and during the COVID-19 lockdown period. *: p<0.05

ity of tinnitus did not change, catastrophic thoughts could change with the improvement in overall QoL. Tinnitus therapy could be beneficial in curing catastrophic thoughts such as loss of control and sleep disturbance, especially when experiencing stress. In previous studies, it was stated that catastrophic thoughts have little relationship with tinnitus severity and that such diseases can be helped with guided counseling (22, 23).

In another study, a high correlation was found between the catastrophic subscale of THI and the emotional subscale of the tinnitus functional scale. The authors suggested the use of subscales evaluating similar aspects of patients' life (24). A recent study in patients with chronic tinnitus suggested that catastrophic thinking about tinnitus is highly correlated with tinnitus-related distress and disability, and lowly associated with QoL and inadequate therapy (25). In our study, the improvement in the overall QoL of patients may have been accompanied by a decrease in catastrophic thoughts. The absence of a relationship between the age and sex of the patients and their tinnitus was found to be compatible with the results of studies by Meric (26).

Directive guidance and masking therapy have been suggested as effective measures to reduce symptoms (27). We observed neither a statistical increase nor a decrease in tinnitus distress in the THI and TQ 12-T total scores during COVID-19. However, our sound therapy program is still in progress in order to scrutiny longer-term results. The study carried out with the tinnitus population in

Italy showed that tinnitus distress increased during the COVID-19 lockdown (12). The authors noted that the lack of environmental masking sounds could increase the conscious perception of the tinnitus sound. We suggested that the sound therapy we provided to the patients might have met the absence of environmental masking noise. Therefore, the participants in our study did not suffer from increased tinnitus distress. The differences in the studies between us and the Italian lockdown period are not staggering.

Existing studies showed significant associations between tinnitus-related distress and pain perceptions. Patients with decompensated tinnitus yielded a significantly higher burden of tinnitus-related distress and pain perceptions, depression, and negative coping attitudes across all measured indices (28). A study on the relationship between headache and tinnitus showed that headache was significantly associated with any tinnitus (OR=2.61) (29). Moreover, if the tinnitus was severe (THI ≥ 58) the relationship was stronger (OR=4.99) (29). The pain relief during the lockdown period, according to the QoL in our study, could be explained by the success of the tinnitus therapies administered to the participants. However, there are many forms of tinnitus and many forms of pain. Since pain has multidimensional contributions, further studies are needed to reveal this relationship in detail.

Our study has several limitations. Although the tinnitus therapies were administered to the patients before their staying-at-home process, the lack of teleconsultation during their follow-up was

considered a limitation. Some of the patients did not continue the recommended therapies; therefore, the study population was relatively small. To reduce the lack of interaction between patients and clinicians because of stay-at-home or busy clinical situations, eHealth is indispensable for future therapies. An audiologist-guided Internet-based cognitive-behavioral therapy (iCBT) has proven a promising success as a tinnitus therapy option in terms of long- and short-term outcomes (30).

CONCLUSION

In this study, although THI and mini-TQ scores were assumed to be lower during the lockdown compared to pre-lockdown patients with tinnitus, no major differences were observed except for the emotional subscale of THI. These results are compatible with other studies on tinnitus-related distress and the COVID-19 lockdown period. Moreover, better results were obtained for the catastrophic subscale of THI and QoL assessments, which could be explained by the lack of environmental masking filled with sound therapies during the lockdown period.

Ethics Committee Approval: The Ankara Yıldırım Beyazıt University Clinical Research Ethics Committee granted approval for this study (date: 09.07.2020, number: 2020/55).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – EG; Design – EG, BÇ; Supervision – EG; Resource – EG, BÇ; Materials – EG, BÇ; Data Collection and/or Processing – EG, BÇ; Analysis and/or Interpretation – EG, BÇ; Literature Search – EG; Writing – EG, BÇ; Critical Reviews – EG.

Conflict of Interest: The authors have no conflict of interest to declare.

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