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Assessing the Efficacy of Cognitive-Behavioral Interventions on Mental Health in Tracheostomy Patients

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Quantitative Study

Abstract

Background: Tracheostomy patients commonly develop anxiety and depression. This study investigates the efficacy of cognitive-behavioral interventions in improving mental health and quality of life (QOL) in tracheostomy patients. The focus is on assessing the effectiveness of structured psychological support as part of holistic tracheostomy recovery protocols.

Methods: In this randomized controlled trial (RCT) conducted at Baghdad Teaching Hospital, Iraq, in the second half of 2022, we included 100 tracheostomy patients. The sampling method was convenience sampling, and the study population comprised tracheostomy patients referred for treatment. Participants were randomly allocated into two groups: an intervention group receiving tracheostomy education and cognitive-behavioral training (n = 50) and a control group receiving conventional care (n = 50). We used the Beck Anxiety Inventory (BAI) and the Beck Depression Inventory (BDI) to measure anxiety and depression, and the 36-Item Short Form Survey (SF-36) to assess QOL. The

statistical analysis was performed using SPSS software, employing chi-square test and Mann-Whitney U-test.

Results: This study showed significant improvements in anxiety and depression among tracheostomy patients receiving cognitive-behavioral interventions. Anxiety scores in the intervention group decreased from 23.66 ± 14.73 to 14.44 ± 10.36, while the control group saw negligible change. Depression scores similarly improved in the intervention group, dropping from 16.82 ± 9.31 to 12.30 ± 8.10, with the control group remaining stable. QOL, measured via the SF-36, also improved, with notable increases in physical health and mental health scores for the intervention group, affirming the effectiveness of the cognitive-behavioral approach in enhancing mental health outcomes for tracheostomy patients.

Conclusion: Cognitive-behavioral therapy (CBT) coupled with tracheostomy self-care education demonstrated meaningful improvements in mental health and QOL compared to conventional care over a 6-month follow-up. These findings support integrating structured psychosocial guidance within holistic post-tracheostomy recovery protocols.

Keywords: Cognitive behavioral therapy; Tracheostomy; Quality of life; Psychotherapy

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Introduction

A tracheostomy is a medical intervention that involves creating an opening in the trachea, or windpipe, to facilitate breathing (Patton, 2019). This procedure is typically performed when the normal breathing pathway is obstructed or narrowed, as can occur with conditions like vocal cord paralysis or throat cancer (Allen et al., 2021; Paul, Echterdiek, Bohle, & Zoller, 2020). It may also be necessary for individuals who require long-term use of a ventilator.

Tracheostomy care involves several key steps. Patients learn how to suction the tracheostomy tube to remove secretions from the airway, thereby improving their ability to breathe. It is also crucial to safeguard the airway at all times. For example, patients should avoid immersing themselves in water or allowing water to spray directly into the tracheostomy. Utilizing a humidifier, particularly during sleep, can help keep secretions thin and prevent them from blocking the tracheostomy tube (Antoniou, Wray, Kenny, Hewitt, Hall, & Cooke, J, 2022; Pandian et al., 2022; Wang, Mazanec, Schiltz, Chhabra, Rezaee, & Voss, 2023).

While a tracheostomy is often a temporary measure, providing an alternative route for breathing until other health issues are addressed, it can be a permanent solution for some individuals (Zhou et al., 2022). Regardless of its duration, meticulous care and maintenance of the tracheostomy are essential for the patient's wellbeing. Patients undergoing tracheostomy often grapple with significant psychological distress (Pierucci et al., 2023). A staggering 69% of these patients are classified as having at least borderline anxiety or depression, and a concerning 25.4% meet the criteria for both conditions (Shibata et al., 2022). The mental health trajectory for these individuals tends to be on a downward slope. They frequently express feelings of fear, overwhelm, lack of support, self-consciousness, powerlessness, judgment, and isolation (Foster, 2010). Communication challenges, which can be anticipated in 16% to 24% of tracheostomy patients, particularly those requiring prolonged mechanical ventilation, can significantly amplify their anxiety levels (Daraie, Hasanvand, Goudarzi, & Rassouli, 2021; Moser et al., 2022; Nakarada-Kordic, Patterson, Wrapson, & Reay, 2018). These challenges have the potential to markedly heighten patient anxiety, prompting behavioral shifts such as social withdrawal and avoidance of specific situations or activities (Streppel, Veder, Pullens, & Joosten, 2019).

The data underscores the importance of prioritizing mental health considerations in the treatment of tracheostomy patients. It is crucial to assess the extent of these mental health issues and implement suitable preventative measures or therapeutic interventions accordingly. Several studies have suggested that psychological interventions, such as cognitive therapy and relaxation training, can effectively mitigate levels of anxiety and depression (Mehta et al., 2022; Keyvanfar et al., 2022; Andreevich et al., 2023; Bakytbekovich et al., 2023; Hall et al., 2023).

Considering the critical implications of tracheostomy procedures and the prevalent onset of anxiety and depression disorders following these procedures, the importance of psychotherapeutic interventions for tracheostomy patients has been increasingly recognized. This study is designed to explore the efficacy of cognitive-behavioral therapy (CBT) in mitigating the levels of anxiety and depression among patients who have undergone tracheostomy.

Methods

Study design and participants: This research was an analytical study conducted as a randomized controlled clinical trial (RCT) with a control group at the Baghdad

Teaching Hospital, Iraq, in the second half of 2022. The study population consisted of all tracheostomy patients who were referred for treatment. The sampling method was convenience sampling, and all patients who were eligible to enter the study were included until the calculated sample size was reached.

The inclusion criteria were patients aged 20-75 years, with no previous tracheostomy, no history of thoracic surgery, and the possibility of patient follow-up. Patients who underwent a change in their tracheostomy tube during follow-up, patients diagnosed with severe psychiatric disorders such as psychotic disorders, bipolar mood disorder, major depressive disorder, and panic disorder, and patients with simultaneous physical diseases that made the patients weak and paralyzed [such as multiple sclerosis (MS)] were excluded from the study. The exclusion criteria were based on the patient's clinical record and consultation with psychiatric and respiratory specialists.

Sample size: Considering a type I error of 5%, a study power of 80%, and based on the sample size calculation relationship, the sample size was calculated to be 100 people in a population where the variance of Beck's score was known. Beck's score refers to the Beck Depression Inventory (BDI), a widely used psychometric test for measuring the severity of depression (Fawzi, Fawzi, & Abu-Hindi, 2012).

Instruments and variable: In this study, the participants were divided into two groups in a simple random manner: the control group, which received conventional care after the tracheostomy procedure, and the case group, which received training about tracheostomy care and its differences with anxiety symptoms in three sessions at one-month intervals (Table 1). Relaxation training by progressive muscle relaxation and coordinated breathing, and cognitive methods to deal with negative thoughts were given by the psychiatrist of the unit. These therapeutic interventions were performed by the same therapeutic team including a psychiatrist skilled in cognitive therapy. No psychiatric treatment was performed between psychotherapy sessions.

Before the interventions, participants in both groups completed several distinct questionnaires. Firstly, they filled out a standard mood disorder questionnaire, specifically designed for evaluating and grading various mood disorders. This tool is critical for assessing the baseline psychological state of the patients.

In addition to this, the 36-Item Short Form Survey (SF-36) was administered. The SF-36 is a widely recognized instrument for evaluating health status and quality of life (QOL). It encompasses multiple domains including physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, mental health, and vitality.

Furthermore, the Beck Anxiety Inventory (BAI) and the BDI were also used. The BAI is a 21-item self-report inventory that is used for measuring the severity of an individual's anxiety. Similarly, the BDI, consisting of 21 items as well, is employed to measure the existence and severity of symptoms of depression. The reliability and validity of these questionnaires, including their Arabic versions, have been previously confirmed in several studies.

Table 1. Comprehensive management training program: Session topics and key points

Session	Topic	Key points
1	Understanding tracheostomy care	Types of tracheostomies, proper cleaning and maintenance, risks
2	Communication techniques	Assistive devices, non-verbal communication, managing anxiety
3	Building social support network	Identifying sources of support, expressing needs clearly

Notably, the SF-36, BAI, and BDI have been validated for use in Arabic-speaking populations (AlHadi et al., 2017; Sheikh, Yagoub, Elsatouhy, Al Sanosi, & Mohamud, 2015).

After the psychiatric interventions, these questionnaires were administered again at three- and six-month intervals to assess the changes in patients' mental health and QOL post-intervention.

Analysis: The scores obtained before and after the intervention were compared in the two groups, and for this purpose, the chi-square test was used to compare the ratios and the Mann-Whitney U-test was used to compare the scores in the two groups. The statistical software used was SPSS (version 23.0, IBM Corporation, Armonk, NY, USA) and the significant statistical limit in this study was $P < 0.05$.

Ethics: Ethical approval for this study was granted by the College of Medicine, University of Baghdad. Informed consent was rigorously obtained, ensuring participants were fully aware of the study's scope, potential risks, and benefits. Participants' confidentiality was paramount. Personal identifiers were removed from all documents, and data were securely stored, accessible only to the research team. The study design prioritized participants' welfare, with provisions to address any psychological distress and the option to withdraw at any time without affecting their standard care. The interventions were non-invasive, based on established therapeutic techniques, presenting minimal risk. The anticipated benefits, such as improved mental health outcomes, significantly outweighed these risks. The study was free from funding influence, with all potential conflicts of interest disclosed. Compliance with the Declaration of Helsinki and other regulatory standards was stringently maintained, ensuring ethical integrity throughout the research process.

Results

This study included 50 tracheostomy patients in the intervention group and 50 tracheostomy patients in the control group. In the intervention group, 18 (36%) were women and 32 (64%) were men, and in the control group, 20 (40%) were women and 30 (60%) were men. The comparison of these ratios did not show a significant statistical difference ($P = 0.80$). In the intervention group, 35 people (70%) were married and 15 people (30%) were single, and in the control group, 31 people (62%) were married and 19 people (38%) were single ($P = 0.398$).

In terms of education, in the intervention group, 32 people (64%) had a diploma, 15 people (30%) had a diploma or post-diploma, and three people (6%) had a bachelor's degree or higher. In the control group, 31 people (62%) had a diploma, 15 people (30%) had a diploma or post-diploma, and four people (8%) had a bachelor's degree or higher ($P = 0.871$).

In terms of clinical records, five people (10%) in the intervention group and three people (6%) in the control group had a history of respiratory failure requiring mechanical ventilation ($P = 0.715$). There were 38 patients (76%) in the intervention group and 39 patients (78%) in the control group with underlying lung disease leading to the need for tracheostomy ($P = 0.812$). The average oxygenation score in the intervention group was 95 ± 2% and 94 ± 3% in the control group ($P = 0.791$). Underlying conditions leading to tracheostomy placement in the intervention group included 32 patients (64%) with chronic obstructive pulmonary disease (COPD) and 18 patients (36%) with respiratory failure due to other reasons, and in the control group, 36 patients (72%) had COPD and 14 patients (28%) had respiratory failure due to other causes ($P = 0.539$). The average time interval from tracheostomy operation to the start of rehabilitative therapy was 9.2 ± 1.9 days in the intervention group and 8.8 ± 1.5 days in the control group ($P = 0.618$).

Table 2. Repeated measures analysis of variance (ANOVA) of Beck's anxiety and depression scores

Variable	Group	Time point	Mean ± SD	F-statistic	P-value	Effect size (η^2)
Anxiety	Intervention	Pre-intervention	23.66 ± 14.73	F (3,147) = 8.25	< 0.001*	0.15
		Post-intervention	18.62 ± 10.74			
		Three months	17.48 ± 10.36			
		Six months	14.44 ± 10.36			
	Control	Pre-intervention	22.99 ± 15.01	F (3,147) = 0.22	0.883	0.01
		Post-intervention	23.28 ± 15.58			
		Three months	23.18 ± 14.82			
		Six months	22.71 ± 13.49			
Depression	Intervention	Pre-intervention	16.82 ± 9.31	F (3,147) = 6.88	0.001*	0.13
		Post-intervention	14.75 ± 8.90			
		Three months	13.60 ± 8.50			
		Six months	12.30 ± 8.10			
	Control	Pre-intervention	16.50 ± 9.40	F (3,147) = 0.18	0.910	0.01
		Post-intervention	16.60 ± 9.50			
		Three months	16.55 ± 9.45			
		Six months	16.45 ± 9.35			

SD: Standard deviation; * P < 0.05 indicates statistical significance

Table 2 compares the mean scores of anxiety and depression at four different time points: pre-intervention, post-intervention, three months post-intervention, and six months post-intervention.

The results demonstrated significant improvements in anxiety and depression scores in the intervention group, as indicated by the P-values and effect sizes, particularly at the six months post-intervention mark. In contrast, the control group exhibited minimal changes throughout the study period, underscoring the effectiveness of the intervention. The prevalence and proportion of anxiety and depression instances pre-test and post-test in both the intervention and control groups are detailed in table 3.

Table 3. Longitudinal impact of cognitive-behavioral therapy (CBT) on anxiety and depression in tracheostomy patients: Pre- and post-intervention analysis at three and six months

Variable	Group	Condition	Pre-intervention	Post-intervention	Three months post-intervention	Six months post-intervention
Anxiety	Intervention	Normal	11 (22)	11 (22)	15 (30)	27 (54)
		Mild	13 (26)	14 (28)	14 (28)	14 (28)
		Moderate	13 (26)	14 (28)	12 (24)	6 (12)
		Severe	13 (26)	11 (22)	9 (18)	3 (6)
	Control	Normal	14 (28)	13 (26)	12 (24)	19 (38)
		Mild	14 (28)	14 (28)	15 (30)	9 (18)
		Moderate	7 (14)	8 (16)	8 (16)	15 (30)
		Severe	15 (30)	15 (30)	15 (30)	5 (10)
P-value			0.541	0.458	0.107	0.020*
Depression	Intervention	Normal	18 (36)	20 (40)	27 (54)	33 (66)
		Mild	17 (34)	17 (34)	12 (24)	10 (20)
		Moderate	11 (22)	10 (20)	8 (16)	5 (10)
		Severe	4 (8)	3 (6)	3 (6)	2 (4)
	Control	Normal	19 (38)	20 (40)	21 (42)	23 (46)
		Mild	13 (26)	14 (28)	9 (18)	8 (16)
		Moderate	13 (26)	13 (26)	15 (30)	16 (32)
		Severe	5 (10)	3 (6)	5 (10)	3 (6)
P-value			0.827	0.580	0.531	0.182

*The statistical analysis was conducted using χ^2, with a significance threshold set at P < 0.05
Data are reported as n (%).

Table 4. Comparative analysis of quality of life (QOL) scores in intervention and control groups pre- and post-intervention at three and six months

Variable	Group	Pre-intervention	Post-intervention	Three months post-intervention	Six months post-intervention
Physical health	Intervention	24.23 ± 19.57	24.99 ± 19.57	27.08 ± 22.52	36.67 ± 25.56
	Control	24.80 ± 20.90	25.37 ± 18.05	27.55 ± 22.71	32.59 ± 22.33
	P-value	0.861	0.848	0.887	0.103
Mental health	Intervention	19.48 ± 16.44	24.23 ± 17.20	29.74 ± 24.32	30.97 ± 30.69
	Control	26.22 ± 20.24	19.00 ± 13.78	19.38 ± 17.10	20.33 ± 13.30
	P-value	0.670	0.204	0.008*	0.002*
State of tranquility and security	Intervention	42.28 ± 13.40	45.89 ± 21.38	47.79 ± 12.73	50.64 ± 9.69
	Control	43.80 ± 11.12	45.03 ± 26.70	41.90 ± 11.21	41.42 ± 9.88
	P-value	0.547	0.770	0.009*	0.001*
Physical distress	Intervention	57.57 ± 2.09	60.99 ± 1.52	64.79 ± 2.00	64.41 ± 1.81
	Control	51.59 ± 2.47	55.58 ± 21.17	54.25 ± 2.09	56.53 ± 2.00
	P-value	0.199	0.362	0.012*	0.037*
General health	Intervention	27.74 ± 10.93	27.46 ± 13.40	32.68 ± 10.64	38.48 ± 10.17
	Control	24.80 ± 11.12	23.75 ± 12.26	28.12 ± 11.31	27.17 ± 10.64
	P-value	0.155	0.267	0.059	0.001*

*The statistical analysis was conducted using Mann-Whitney U-test, with a significance threshold set at $P < 0.05$
SD: Standard deviation
Data are reported as Mean ± SD.

The analysis of these data revealed no significant statistical disparity between the intervention and control groups either before or after the intervention. Lastly, table 4 provides the mean scores obtained from the SF-36 assessment for both groups.

This table demonstrates that the cognitive-behavioral intervention had a positive impact on several aspects of QOL, particularly on mental health, state of tranquility and security, physical distress, and general health, as opposed to physical health which showed minimal changes.

Discussion

This study aimed to assess the efficacy of a comprehensive cognitive-behavioral intervention program on mitigating anxiety and depression levels among tracheostomy patients. While both groups exhibited high baseline levels of anxiety and depression, likely attributed to the significant physical and psychological implications of undergoing a tracheostomy procedure, the intervention group demonstrated steady improvements in their mental health over the six-month follow-up period. This contrasted starkly with the control group, which showed no meaningful changes in anxiety and depression over time, highlighting the effectiveness of the intervention.

Existing research corroborates the mental distress experienced by many tracheostomy patients. Shibata et al. reported a high prevalence of anxiety and depression in a similar patient cohort. Our findings resonate with these observations and align with literature demonstrating the benefits of psychological interventions in respiratory compromised patients (Mehta et al., 2022). For instance, mobility interventions in patients with acute respiratory failure have shown to improve mental health, akin to the diverging anxiety and depression patterns observed in our study groups.

A detailed examination of our anxiety and depression data reveals an intriguing pattern. In the intervention group, although the prevalence of moderate to severe anxiety remained relatively stable post-intervention, there was a notable increase in the proportion of patients classified as normal or mild. This suggests a reduction in the severity of anxiety symptoms for a significant portion of patients. Our

cognitive-behavioral interventions seem to have equipped patients to better manage their concerns, which is crucial considering the communication restrictions imposed by tracheostomies (Moser et al., 2022).

Depression levels, in contrast, showed more uniform improvements across all severity categories. This could be attributed to early communication training provided to patients, aiding them in coping with the initial non-verbal period post-tracheostomy. Such training might have offered productive alternatives like mood journaling and non-verbal expression of needs, contributing to the observed decline in depression levels (Patton, 2019).

Importantly, our intervention also positively impacted the overall QOL, as evidenced by the SF-36 assessment. The intervention group showed significantly better scores in physical distress, mental health, tranquility/security, and general health parameters at three and six months post-intervention compared to controls. This suggests that our comprehensive approach, encompassing tracheostomy self-care, anxiety management, and social support, not only enhanced mental health but also improved the overall well-being of participants.

Despite these promising findings, some limitations of our study should be noted. The single-center design and specific inclusion criteria limit the generalizability of our results. Additionally, the cognitive aspect of our intervention necessitates sufficient cognitive capacity, which might be challenging for some patient demographics. While self-reported metrics like the Beck assessments provide valuable insights, they are subject to subjectivity and recall biases. Nevertheless, our controlled methodology and the use of multidimensional outcome measures offer a robust assessment of the efficacy of cognitive-behavioral interventions in this patient population.

Conclusion

This clinical trial demonstrates that a structured patient education and cognitive-behavioral intervention program spanning tracheostomy self-care, communication approaches, and social support cultivation can meaningfully improve the mental health and QOL trajectories of tracheostomy patients. Our findings highlight the potent distress individuals frequently endure post-procedure and signify that structured psychosocial guidance should be considered an integral component of holistic tracheostomy recovery. Moving forward, investigating sustainability of mental health improvements beyond six months would further reinforce the role of CBT among recently tracheostomized patients. Additionally, given unavoidable between-patient variability in respiratory capacities, tailoring psychological support approaches to individual functional status could optimize outcomes. Regardless, our study strongly advocates dedicating formal attention toward the profound emotional implications of abrupt, invasive tracheostomy procedures.

Conflict of Interests

Authors have no conflict of interests.

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