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RESEARCH ARTICLE / ARAŞTIRMA YAZISI

Anxiety Levels in COVID-19 Patients Undergoing Upper Arm and Breathing Exercises

Üst Kol ve Nefes Egzersizleri Uygulanan COVID-19 Hastalarında Anksiyete Düzeyleri

Nurul Citta Banu Putri[1], Amira Permatasari Tarigan[1], Pandiaman Pandia[1], Andika Pradana[1], Putri Chairani Eyanoer[2], Sudirman Parningotan Sinaga[3], Elmeida Effendy[4]

Abstract:

The number of COVID-19 cases in Indonesia has reached more than 1.5 million, of which 121,011 people are still in treatment. Stress and anxiety are the dominant psychological aspects of COVID-19 pandemic and have been shown to affect overall quality of life. Therefore, this research aims to assess the level of anxiety in severe COVID-19 patients before and after undergoing upper arm exercises and breathing exercises. This study is a clinical trial using a two-group pretest-posttest quasi-experimental study design on 36 patients who diagnosed with confirmed COVID-19 severe severity who were treated in isolation room for 6 months period who met the inclusion and exclusion criteria. Then, baseline examinations were conducted such as: vital signs, laboratories, and Hospital Anxiety and Depression Scale (HADS) in the emergency room for COVID-19 patients before undergoing physiotherapy. A comparison of the results of HADS measurements was made between before and after the intervention (upper arm exercises and breathing exercises). If the data were normally distributed, paired t-test was used ($p<0.05$). If the data is not normally distributed, Wilcoxon's test were used. The study sample was dominated by men with a total of 23 people (63.9%) compared to 13 women (36.1%). Conditions before exercise, found 18 people (50%) moderate cases, 17 people (47.2%) severe cases and 1 person (2.8%) mild cases. In the post-exercise condition, there were 15 people (41.7%) with moderate cases, 12 people (33.3%) severe cases and 9 people (25%) mild cases. Out Of 53 severe COVID-19 patients who performed upper arm exercises and breathing exercises, the average HADS measurement results before exercise was 14.27 + 2.02 and after exercise 12.19 + 3.20. It was found that mean difference before and after exercise was 2.0833 + 2.11. After t paired test was done, a significance p value was found = 0.000 ($p<0.05$). Anxiety level in severe COVID-19 patients significantly difference before and after undergoing upper arm exercises and breathing exercises.

Keywords: COVID-19, Upper arm exercises, breathing exercise, anxiety

[1]Research Assist., Sumatera Utara University, Faculty of Medicine, Department of Pulmonology and Respiratory Medicine, Utara-Indonesia, cittapulmo20@gmail.com, Orcid; 0000-0001-9419-2477
[1]Assoc. Prof.Dr., Sumatera Utara University, Faculty of Medicine, Department of Pulmonology and Respiratory Medicine, Utara-Indonesia, amira@usu.ac.id, Orcid; 0000-0003-1744-1833
[1]Assist. Prof. Dr., Sumatera Utara University, Faculty of Medicine, Department of Pulmonology and Respiratory Medicine, Utara-Indonesia, ps_pandia@yahoo.com, Orcid; 0000-0003-3689-597X
[1]Assist. Prof. Dr., Sumatera Utara University, Faculty of Medicine, Department of Pulmonology and Respiratory Medicine, Utara-Indonesia, pradanaandika@gmail.com, Orcid; 0000-0002-7761-2086
[2]Assoc. Prof. Dr., Sumatera Utara University, Faculty of Medicine, Department of Preventive and Community Medicine, Medan -Indonesia, putrieyanoer@usu.ac.id, Orcid; 0000-0002-4741-1486
[3] Asisst. Prof. Dr., Sumatera Utara University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Medan -Indonesia, susinaga@yahoo.com, Orcid; 0000-0001-6204-7670
[4] Prof. Dr., Sumatera Utara University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Medan -Indonesia, micipsych@yahoo.com, Orcid; 0000-0002-9382-3609
Address of Correspondence/Yazışma Adresi: Amira Permatasari Tarigan, Sumatera Utara University, Faculty of Medicine, Department of Pulmonology and Respiratory Medicine, Utara-Indonesia, E-mail: amira@usu.ac.id
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Öz:

Endonezya'daki COVID-19 vaka sayısı 1,5 milyonu aşmış olup, 121.011 kişi halen tedavi görmektedir. Stres ve anksiyete, COVID-19 pandemisinin baskın psikolojik yönleridir ve genel yaşam kalitesini etkilediği gösterilmiştir. Bu nedenle, bu araştırma şiddetli COVID-19 hastalarında üst kol egzersizleri ve nefes egzersizlerinden önce ve sonra anksiyete düzeyini değerlendirmeyi amaçlamaktadır. Bu çalışma, iki gruplu ön test-son test yarı deneysel çalışma tasarımının kullanıldığı bir klinik araştırmadır. 6 ay boyunca izolasyon odasında tedavi gören, dahil etme ve hariç tutma kriterlerini karşılayan, doğrulanmış COVID-19 ağır şiddeti tanısı almış 36 hasta üzerinde gerçekleştirilmiştir. Ardından, COVID-19 hastalarına fizyoterapi uygulanmadan önce acil serviste yaşamsal bulgular, laboratuvarlar ve Hastane Anksiyete ve Depresyon Ölçeği (HADS) gibi başlangıç muayeneleri yapılmıştır. Müdahale öncesi ve sonrası (üst kol egzersizleri ve nefes egzersizleri) arasında HADS ölçümlerinin sonuçları karşılaştırılmıştır. Veriler normal dağılıma sahip olduğu için çift yönlü t-test kullanılmıştır ($p<0,05$). Veriler normal dağılım göstermediği için Wilcoxon testi kullanılmıştır. Çalışma örnekleminde 13 kadına (%36,1) kıyasla toplam 23 kişi (%63,9) ile erkekler ağırlıktaydı. Egzersiz öncesi koşullarda 18 kişide (%50) orta, 17 kişide (%47,2) şiddetli ve 1 kişide (%2,8) hafif vakalar tespit edilmiştir. Egzersiz sonrası durumda ise 15 kişide (%41,7) orta, 12 kişide (%33,3) ağır ve 9 kişide (%25) hafif vaka görülmüştür. Üst kol egzersizleri ve nefes egzersizleri yapan 53 ağır COVID-19 hastasının egzersiz öncesi ortalama HADS ölçüm sonuçları 14,27 + 2,02 ve egzersiz sonrası 12,19 + 3,20 idi. Egzersiz öncesi ve sonrası ortalama fark 2,0833 + 2,11 olarak bulunmuştur. Çift yönlü t testi yapıldıktan sonra anlamlılık p değeri = 0.000 bulunmuştur ($p<0.05$). Şiddetli COVID-19 hastalarında anksiyete düzeyi, üst kol egzersizleri ve nefes egzersizlerinden önce ve sonra önemli ölçüde farklılık göstermektedir.

Anahtar Kelimeler: COVID-19, Üst kol egzersizleri, nefes egzersizi, anksiyete

Introduction

Incidence of COVID-19 cases in Indonesia has reached more than 1.5 million, of which 1.3 million cases have recovered and there are still 121,011 people who are still on treatment. The number of COVID-19 deaths in Indonesia has reached more than 41,000 people. COVID-19 cases in March and April have an average addition of approximately 5,000-6000 cases/day with a similar cure rate. The number of cases of COVID-19 in North Sumatra Province itself has reached 27 thousand cases with 24 thousand recovered cases and 915 documented deaths until April 2, 2021 (Indonesian Ministry of Health, 2022).

Stress and anxiety have emerged as the dominant psychological aspects of the COVID-19 pandemic. Exceptional situations, such as epidemics, can cause stress and anxiety. Indonesians describe the impact of the COVID-19 pandemic on wider dimensions of their lives. Many people are starting to worry, feeling exposed to the COVID-19 virus, worrying about their lives, losing their jobs and losing loved ones. Additionally, in various mass media (television, radio, newspapers) and social media news, headlines have focused on COVID-19 prevalensce and deaths (Asmundson & Taylor, 2020). This increase in cases was therefore important for pulmonary rehabilition to restore normal function.

Pulmonary rehabilitation can improve a patient's quality of life, daily activities and overall functional ability, regardless of the patient's age. Isolated COVID-19 patients in quarantine may improved after pulmonary rehabilitation program via user guides, educational videos, or telemedicine. After the inpatient program ends, they can continue PR counseling and self-management using telemedicine technology. However, during telemedicine, researchers were unable to asses their 6MWT, manual muscle testing, grip strength, and gait (Siddiq et al., 2020) Studien have shown that gain aerobic capacity in COVID-19 patients is associated with immune system improvements (immune cell function and immunoglobulin levels) and respiratory systems (acting as antioxidants, antibiotics, and antimycotics, and resilience. It has been shown that it can lead to short-term improvements in recovery of blood pressure and recovery of normal strength. lung tissue). Aerobic exercise minimizes anxiety and depression (Siddiq et al., 2020).

With the implementation of lockdowns, people are allowed to work from home, take online classes and participate in common social networks, including religious community, resulting in people experiencing stress and unregulated emotional outbursts, which lead to individuals tend to develop psychological disorders. In addition to social dynamics, people also experience serious emotional and mental changes regarding their anxiety about the future and also their fear. An assesment of anxiety and depression in Hong Kong in COVID-19 era shown that 19% of 500 respondents experienced depression and 14% experienced anxiety. In addition, 25.4% reported deteriorating mental health since pandemic, especially those infected with anxiety and depression. Of 460 COVID-19 patients (66.09%) in Hubei, it can be shown that 304 people were experiences somatic symptoms followed by depression (53.48%); anxiety (46.30%); insomnia (42.01%); and self-mutilating or suicide (23.26%) (Baker et al., 2021).

High levels of anxiety have been viewed as a contributing factor to personal emotional vulnerability, as it negatively impacts well-being and daily life. In addition, increased anxiety can threaten an individual's health by increasing risk perception and causing depression. Characterized by worry, subjective feelings of nervousness, and anxiety associated with the activation of the nervous system, i.e sweating, palpitations, tachypnea. Physical activity is

thought to be an anxiety-positive mediator, and in some cases, for example by activating compensatory mechanisms, individuals with high levels of anxiety maintain high levels of physical activity (Meira et al., 2020). Therefore, this study aims to examine anxiety levels before and after brachial and respiratory exercises in patients with severe COVID-19.

Methods

This research is a clinical trial using two-group pretest-posttest quasi-experimental study design that aims to assess the level of anxiety in severe COVID-19 patients before and after undergoing upper arm exercises and breathing for 10 days. This research was conducted at General Hospital Haji Adam Malik Medan, North Sumatra Province. The research were carried out within 6 months period.

Research sample were patients with confirmed severe COVID-19 who met inclusion criteria, namely patients with confirmed COVID-19 severe stage who were being treated in New-Emerging Re-Emerging Infectious Disease (PINERE) ward of H. Adam Malik Hospital, aged 18-70. years, oxygen saturation 95%, has experienced cytokine storm, can be with or without comorbidities, willing to follow all research procedures to completion and sign a consent letter after explanation (informed consent); but not included in exclusion criteria, namely patients with COVID-19 who have symptoms of antiviral drugs side effects; COVID-19 patients who use High Flow Nasal Canule (HFNC); COVID-19 patients with decreased consciousness and mental disorders. This criteria was done to avoid any confounding factors that affect intervention results.

Each patient who was included in this research got explanation and signed online informed consent. Baseline examinations such as: vital signs, laboratory, and HADS in ER were carried out in patients with COVID-19 who were research sample before undergoing physiotherapy which is upper arm exercises and breathing exercises, twice a day in an isolation room, for 10 consecutive days. At the end of training session (finished day 10), the vital signs, laboratory, and HADS examinations were re-examined as post-intervention data.

Before starting exercise, sample received a short-acting inhaled bronchodilator such as Salbutamol 2.5 mg. Research sample did a light warm-up and muscle stretching for 5-10 minutes to prevent muscle injury. Exercise procedures include breathing movements, no-way movements, squawking cock movements, calling movements, butterfly movements, lateral trunk bending movements, and cooling movements. Breathing exercise which is breathing control and deep breathing with a frequency of 2 times a day (morning and evening) for 10 days with intensity of 30 minutes. This extremity exercise were carried out based on a video that will be played by researcher. The exercise will be temporarily stopped if sample complains of muscle pain, shortness of breath or headache and then if symptoms has reduced then intervention will be resumed. After the training session ended, the research sample cooled down for 5-10 minutes.

The successful exercise results measured by percentage of HADS score changes that occur. To prove the changes that occurred were tested statistically using T paired test with p value< 0.05, if the data were normally distributed, whereas if the data were not normally distributed Wilcoxon test would be used. This study was approved by Faculty of Medicine Universitas Sumatra Utara with the ethical number 450/KEPK/USU/2022. The detail of HADS table were shown below:

Figure 1. The standard Hospital anxiety and depression scale questionnaire in English

Hospital Anxiety and Depression Scale (HADS)

Tick the box beside the reply that is closest to how you have been feeling in the past week.
Don't take too long over you replies: your immediate is best.

D	A		D	A	
		I feel tense or 'wound up':			**I feel as if I am slowed down:**
	3	Most of the time	3		Nearly all the time
	2	A lot of the time	2		Very often
	1	From time to time, occasionally	1		Sometimes
	0	Not at all	0		Not at all
		I still enjoy the things I used to enjoy:			**I get a sort of frightened feeling like 'butterflies' in the stomach:**
0		Definitely as much		0	Not at all
1		Not quite so much		1	Occasionally
2		Only a little		2	Quite Often
3		Hardly at all		3	Very Often
		I get a sort of frightened feeling as if something awful is about to happen:			**I have lost interest in my appearance:**
	3	Very definitely and quite badly	3		Definitely
	2	Yes, but not too badly	2		I don't take as much care as I should
	1	A little, but it doesn't worry me	1		I may not take quite as much care
	0	Not at all	0		I take just as much care as ever
		I can laugh and see the funny side of things:			**I feel restless as I have to be on the move:**
0		As much as I always could		3	Very much indeed
1		Not quite so much now		2	Quite a lot
2		Definitely not so much now		1	Not very much
3		Not at all		0	Not at all

		Worrying thoughts go through my mind:			**I look forward with enjoyment to things:**
	3	A great deal of the time	0		As much as I ever did
	2	A lot of the time	1		Rather less than I used to
	1	From time to time, but not too often	2		Definitely less than I used to
	0	Only occasionally	3		Hardly at all
		I feel cheerful:			**I get sudden feelings of panic:**
3		Not at all		3	Very often indeed
2		Not often		2	Quite often
1		Sometimes		1	Not very often
0		Most of the time		0	Not at all
		I can sit at ease and feel relaxed:			**I can enjoy a good book or radio or TV program:**
	0	Definitely	0		Often
	1	Usually	1		Sometimes
	2	Not Often	2		Not often
	3	Not at all	3		Very seldom

Please check you have answered all the questions

Scoring:
Total score: Depression (D) _____ Anxiety (A) _____
0-7 = Normal
8-10 = Borderline abnormal (borderline case)
11-21 = Abnormal (case)

Results

After conducting clinical trials using a two-group pretest-posttest quasi-experimental study design on patients with severe COVID-19 who met inclusion and exclusion criteria and underwent upper arm exercises and breathing exercises for 10 days, the following results were obtained.

Table 1. Research Sample Characteristics Frequency Distribution

Gender	Frequency	Percentage (%)
Male	23	63,9
Female	13	36,1
Total	36	100

Based on Table 1. it was found that sample majority as many as 23 people (63.9%) were male and remaining 13 people (36.1%) were female.

Table 2. Frequency Distribution of COVID-19 Severity Levels before and after Exercise

Severity Levels	Before	After
Mild	1 (2,8%)	9 (25%)
Moderate	18 (50,0%)	15 (41,7%)
Severe	17 (47,2%)	12 (33,3%)
Total	36 (100%)	36 (100%)

From Table 2, it was found that COVID-19 patients severity was mostly in moderate stage as many as 18 people (50.0%) followed by severe stage 17 people (47.2%) and only 1 person (2.8%) with mild stage. However, after the exercise was found 9 people (25%) mild stage, 15 people (41.7%) moderate stage and 12 people (33.3%) severe stage.

Table 3. Differences in Anxiety Levels Based on HADS Scale in COVID-19 patients before and after exercise.

	Before exercise	After exercise	Differences	P value
HADS Scale	14,27 $\pm$ 2,02	12,19 $\pm$ 3,20	2,08 $\pm$ 2,11	0.000

From Table 3, it can be concluded that assessment of anxiety experienced by COVID-19 patients used HADS scale and found pre-exercise score was 14.27 + 2.02 with post-exercise score 12.19 + 3.20. T-test results shows that mean difference before and after exercise was 2.0833 + 2.11 and after paired t-test was found a p significance value = 0.000 ($p<0.05$). These results indicate that there is a statistically significant anxiety levels difference in severe COVID-19 patients before and after undergoing upper arm exercises and breathing exercises at H. Adam Malik Hospital, Medan.

Discussion

In this research, sample majority as many as 23 people (63.9%) were male and the remaining 13 people (36.1%) were female. Based on COVID-19 severity, patients

mostly in moderate stage as many as 18 people (50.0%) followed by severe stage 17 people (47.2%) and only 1 person (2.8%) mild stage. However, after the exercise, it was found that 9 people (25%) had mild stage, 15 (41.7%) moderate stage and 12 (33.3%) had severe stage. In line with this study, Nancy et al. study, collected data by interviewing patients using Likert scale on level of communication satisfaction and anxiety levels using Hospital Anxiety and Depression Scale . Participants were predominated between the ages of 41 and 60 years old. Of these, were male subject. 60% of them experienced high school level on their education. It was found that 47% of participants experienced mild anxiety. Furthermore, anxiety levels have been shown to decrease as communication satisfaction increases, with the level of anxiety decreases (r=-0.5 at p=0.01). A significant relationship were shown between anxiety and education levels (p=0.017). The results of this study demonstrate the need to develop adequate communication models during pandemic era and coping strategies for coping measures that will help participants on surviving anxiety (Naomi Nancy et al., 2021). A literature review showed that the sensitivity and specificity of HADS methods shows 0.6 and 0.8 (Bjelland et al., 2002). The effectiveness of upper limb exercises and breathing exercises in COPD stable patients during COVID-19 pandemic era was already elaborated in our previous research, and shows positive outcomes in patients' lung function capacity, exertion scale, , severity of symptoms, muscle mass, and general quality of life. Accordingly, the home-based rehabilitation programme was as effective as the programme conducted at health-care centers.(Tarigan et al., 2022)

The advantages of pulmonary rehabilitations are helps individuals with any degree of lung disease. It is an important part of the integrated treatment of COPD and other chronic respiratory diseases and contributes to patient recovery. One of the most important outcomes of PR is improved survival (Agustí et al., 2003). In addition, benefits of a full PR program include reduced symptoms (dyspnea and fatigue), improved exercise tolerance and health-related quality of life (HRQoL), reduced need for medical care, and physical activity(Ries et al., 2007). In a RCT study which involved 15 years old participants hospitalized with exacerbations, and found that 2 months of pulmonary rehabilitation significantly improved lung function and overall improvement in lung function when the same program was started 2 months after discharged (Kjærgaard et al., 2020). Respiratory muscle training was applied in some studies, at least in 4,444 participants showed the rehabilitation group was significantly greater than the control group in walking test(Salman et al., 2003). Griffith et al. reported an outpatient program conducted for 6 weeks and followed up for 12,444 months. The rehabilitation group happened to significantly alter both physical fitness and health-related quality of life. Of particular importance, the authors noted health benefits associated with completing the rehabilitation program (Griffiths et al., 2001).

Pulmonary rehabilitation is a terms which refers to patient-specific rehabilitation care with chronic lung disease. In exercise training, pulmonary rehabilitation consisting of comprehensive interventions, including nutritional and psychological support, as well as education and behavior modification (Nici et al., 2010). Main topic of this guidelines are : (1) The short-term goal of pulmonary rehabilitation is to reduce dyspnea, anxiety, and depression, and the the long-term goals is to maintain the patient's maximal function and well being, and also improve quality of life, facilitate reintegration into society (2) A comprehensive assessment should be performed before any rehabilitation program is initiated. The results of this assessment can be combined with aerobic exercise, balance, muscle strength, and flexibility for individual and progressive rehabilitation (Sharma & Singh, 2011).

The study results showed that there was a statistically significant difference in anxiety levels before and after brachial exercise and respiratory exercise in severe COVID-19 patients with p significance = 0.000 ($p<0.05$). A significant reduction in anxiety levels in participants who exercised 40 minutes or more per session compared to those who practiced less than 40 minutes per session ($U = 14607.5$; $p = 0.005$), (2) three days or more per week compared with those who trained less than 3 days per week ($U = 12760.5$; $p < 0.0001$), and (3) at least 40 minutes per session over this period compared to those who exercised 3 days or more per week, and also those who did not exercise at all ($U = 14616.5$; $p < 0.0001$) (Meira et al., 2020). The beneficial effects of regular physical activity on health are uncontroversial in modern medicine. Physical activity is often the first step in making lifestyle changes to prevent and treat chronic diseases. According to the U.S. Department of Health and Human Services Physical Activity Report, regular exercise significantly reduced the cause of death in both men and women as many as 30% (U.S Department of Health and Human Services, 2002). Exercise on a treadmill also increases levels of preprogalanin mRNA, indicating that galanin gene expression is sensitive to exercise training stress and has a 'neuromodulatory role' in noradrenergic responses at the locus of the locus coeruleus. suggests that there may be Areas of the brain rich in noradrenergic neurons(Scioloino et al., 2015)

Previous studies has shown that exercise can significantly improve anxiety symptoms. A possible underlying mechanisms is based on modulation of the hypothalamic-pituitary-adrenal (HPA) axis, increased neurogenesis and angiogenesis, upregulation of BDNF, and modulation of the inflammatory system. Dysfunction of the HPA axis plays an important role in the development of anxiety. Unexpected reactions or long-term stress along the HPA axis can cause sympathetic disturbance, anxiety, and hypervigilance, which are closely related to anxiety. However, strength training has been shown to modulate cortisol levels, one of the functional generators of the HPA axis. In addition to learning and memory, the hippocampus is also a key brain region involved in emotional processing and social cognition. Similar to depression, low BDNF levels are a susceptibility factor to anxiety. Many studies have shown that exercise can increase BDNF expression in the dentate gyrus. We found that stress-induced increases were able to lower her BDNF levels, but exercise was able to return her BDNF to pre-stress levels. Modulation of the inflammatory system by exercise is a possible anxiolytic mechanism (Xu et al., 2021).

This is the first research conducted for evaluated exercises program for COVID-19 in Indonesia which is exercises type of upper arm and breathing can easily done by patients with simple gesture. However, researcher also realized that future research with same topic is needed to confim this results and more variety of exercises can be evaluated and recommended for patients especially in

COVID-19 patients who have significantly reduced organ function.

Conclusion

Anxiety level in severe COVID-19 patients significantly difference before and after undergoing upper arm exercises and breathing exercises, therefore upper arm and breathing exercises can be on treatment strategy for severe COVID-19 patients to improved patients outcomes.

Declarations

Ethics Approval and Consent to Participate

This study was approved by Faculty of Medicine Universitas Sumatra Utara with the ethical number 450/KEPK/USU/2022.

Consent for Publication

Not applicable

Availability of Data and Materials

The dataset obtained and analyzed during this study is available from the corresponding author upon reasonable request.

Competing Interests

The author declares that no competing interests in this manuscript.

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Authors' Contributions

NCBP, contributed to the creation of the methodology, design of the research. APT contributed to the the literature reading, review of the datasets. PP contributed to the the writing and presentation of the article. AP contributed to the data collection and analysis. PCE contributed to the literature reading. SPS contributed to the writing and presentation of the article. EE contributed to the writing and presentation of the article.

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