

Application of Active Cycle of Breathing Technique for Patient with Corona Virus at Respiratory Isolation Unit: An Interventional Study

HAIDER MIZHER FENJAN¹, KHALIDA MOHAMMED KHUDUR²

¹Academic Nurse, BSN, MSc, Al-Muthanah Health Directorate, Al-Muthanah, Iraq

²Professor, PhD, Department of Adult Health Nursing, College of Nursing, University of Baghdad, Baghdad, Iraq.

E-mail: Khalidam@conursing.uobaghdad.edu.iq

Corresponding author: Haider Mizher Fenjan, E-mail: haidar.Mozher1202a@conursing.uobaghdad.edu.iq

ABSTRACT

Background: Active Cycle Breathing Techniques is a technique of breathing exercises that contributes as a rehabilitative lung therapy, and helps to improve readings of body physiological variables such as oxygen saturation rate, heart rate, respiratory rate and Burke scale.

Aims: The current study aims to assess the effect of the active course of breathing techniques on patients with coronavirus in the respiratory isolation unit, evaluate the educational program of the active course of breathing techniques on patients with coronavirus in the respiratory isolation unit, in addition to finding the relationship between the effect of active courses of breathing technology on patients with coronavirus. And their social demographic characteristics represented by age, gender, educational level, marital status, occupational status, and area of residence.

Methodology: The design of one group pre-test and post-test, the study was conducted on a non-probability-objective sample consisting of forty patients infected with Corona virus in Yousef Hospital for Isolation in Al-Muthanna Governorate. The statistical methods that were applied using the statistical package for social sciences were adopted, Version 26.0.

Results: The results indicated that the ACBTs achieved a significant improvement in the patients' parameters, and the educational program significantly improved the knowledge and practices of ACBTs at (0.05<P) after 5 days of the intervention.

Conclusion: Active breathing exercise is effective in improving respiratory parameters, especially the effect on oxygen saturation (spo2), heart rate, respiratory rate, and Borg scale (measurement of dyspnea) among coronavirus patients. It helps mobilize the secretions and helps re-expand lung tissue. On the other hand, the research contributed to providing an educational program that strengthened and enriched the knowledge and practices of patients in benefiting from this technology at the level of health care and in their daily lives.

Recommendations: It is recommended to use the active cycle of breathing techniques at least once or more, depending on the patient's condition, with an emphasis on the use of this technique in addition to other physiotherapy techniques. To teach patients about the active course of breathing techniques to improve their knowledge and practice.

Key words: active cycle of breathing techniques(ACBTs) ,COVID-19 patients, respiratory isolation unit, interventional study.

INTRODUCTION

Coronavirus (CoV) is a virus named after the Latin word corona, which means "crown." It can cause a variety of respiratory illnesses in people. Symptoms might range from a simple cold to severe respiratory distress syndrome. SARS-CoV-2, also known as COVID-19 (coronavirus disease of 2019), is a developing global health danger. In the first months, the COVID-19 outbreak began in China's Wuhan city towards the end of December 2019 and quickly expanded to Thailand, Japan, South Korea, Singapore, Iran, and Iraq. Following that, the spread became in Spain, Italy, the United States, the United Arab Emirates, and the United Kingdom. The World Health Organization has published the COVID-19 outbreak a global epidemic. The virus is conveyed by direct contact and can be transferred from animal sources (animals). That is why isolation and prevention strategies play a major role in limiting the spread to contain society Until May 6, 2020, outbreaks and sporadic human infections had led in 3 732 046 confirmed cases and 261 517 deaths.¹⁶

Fever (89 percent), cough (68 percent), tiredness (38 percent), sputum production (34 percent) and shortness of breath (19 percent) are the most prevalent symptoms of COVID-19 infection. About 14 percent of individuals develop a severe form of COVID-19 that necessitates hospitalization, and 5 percent require admission to a respiratory intensive care unit (RCU). Breathing exercises can assist manage some respiratory illnesses, symptoms, and mucus. On the other hand, the exercises' goals are to clear the lungs of sticky mucus and to coordinate breathing with medicine.⁵

Breathing exercises are a popular approach to improve breathing ability. During COVID-19 lockdown, treatments were administered to improve breath holding duration at a decreased level of perceived exertion. An Active Breathing Technique is a patient-performed that can be utilized to move and eliminate excess pulmonary sputum in order to enhance lung function. It is a flexible therapeutic method that may be used in conjunction with positioning and is adapted to most patients' needs.¹⁴

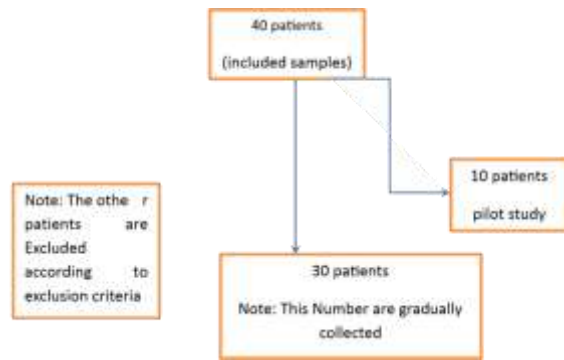
Active cycle of breathing therapy is a self-administered, non-invasive approach that is extensively utilized. In the active cycles of breathing method, a cycle of huffs from mid to low pulmonary function is distributed with deep breathing and abdominal breathing is replaced. Components include breathing control, thoracic expansion exercises (deep breathing exercises with an emphasis on inspiratory hold before expiration), forced expiration (three huffs) in a predetermined cycle, and coughing.¹⁹

In the short term, the Active Cycle of Breathing Technique, which is one of the chest physiotherapy treatments, helps patients with COVID 19 ease dyspnea, anxiety, and depression; in the long term, it improves physical functions, which improves quality of life and helps return to society. When given early on, it has been claimed that it improves gas exchange, slows pathological development, and reduces or eliminates the requirement for mechanical ventilation.¹

METHODOLOGY

A pre-experimental, one-group of pre and posttest research design was chosen to measure the effect of active cycle breathing techniques among patients infected with Coronavirus, an interventional study martyr Youssef hospital for isolation after obtaining formal permission with hospital authority . This design was chosen for one group due to the lack of samples and the purposeful selection of patients selected for the study. The study started in 4 October 2021 and ended at 10 April 2022.

Purposive (non-probability) sample covers (40) patients who admitted in isolation hospital . (10) patients used for the pilot study, were included in the study. The rest (30) patients for the study implementation, who stay in hospital as average days for 5- 7 days based on patients status. The study included one group, this group was exposed to an instructions of technique . The preliminary were included(10)patients in study and measure the needing to study. The collected samples over period of begin study from gradually admissions . As the following diagram explain the numbers of patient according to included criteria



The Criteria for Selection the Sample go as the following for Cooperative Patient, Not On Mechanical Ventilation, Not Need O2 Continuously, Spo2 Above 85, Thick sputum., Able To Tolerate the Application Of Breathing Techniques As Possible and The Patient who have Positive PCR Test or suspected covid 19 infection

The study was conducted in isolation unit at Martyr Yousef Hospital which initiated in September of 2020 , at Al-Samawa City. The number of sections in it three sectors each sectors have twenty eighth room, and each independent rooms that contain a bathroom with a toilet. The room can accommodate two beds. This hospital specialized for admitted patients infected with covid 19 in al- samawa city of al- muthana governorate. Al-Samawa City is a center of Al-Muthanna Province that contains main hospital isolation for positive infection of Covid 19 in City center.

Phases of the Study: The study implemented on patients about breathing techniques comes through the following phases:

Preliminary Assessment: The researcher formulated a set of questions consisting of 12 questions and presented them to patients to know the extent of their knowledge of this techniques . The preliminary study included (10) patients and the Result of preliminary study was poor at four patients and fair at six patients so give the need to work this study. An approach of closed ended structured questions were given to each patient on a time period between (5-10) Minutes related to patient's knowledge toward active cycle of breathing techniques and corona virus. These questions included the answer (Yes) if the statement was correct and take (1) and the answer is (No) if the answer was wrong and take(0). In text of questionnaire , there are some questions formulated in incorrect way to assess if the patients able differentiate it.

The Pilot Study: A pilot study is a smaller version of a suggested or planned research that is carried out to perfect the technique before a bigger study is carried out. The application of assessment needs was done on a sample of (10) patient for pilot study at the isolation unit.

The pilot study made in test knowledge and practices in tow stages

1. The Knowledge stage : we measure the knowledge as pre test , the answered based on questionnaire(Yes/NO) answer and after instruction the active cycle of breathing techniques (ACBT) for 5 days, we measure the knowledge as post test .
2. The Practices stage : we measure the practices firstly by observation each patient (observational checklist). The outcome be apply or don't apply the ACBTs as pre test and after completing the instruction for each patient ,we measure the post test observations .
3. Parameters measurement: the pilot study measure the validity of instrument so the the parameters have identical general rate fixed.

The questionnaire instrument was introduced to a panel of (12) experts to determine its validity to research project. The experts had more than (5-35) years of experience in their field. Minor changes were conducted on few items of the questionnaire and the program according to the experts' suggestions. some of experts introduce modification and other agree with instrument ,

after that the researcher discusses with supervisor about these modification and some of its refused because there is no agree with study plan.

The questionnaire's reliability was statistically good, indicating that it had an appropriate degree of internal consistency and equivalent measurability. The Pearson Correlation Coefficient was utilized to establish the instrument's reliability, and the test-retest procedure was employed to determine the dependability. Statistical Package for Social Science Program (IBM SPSS) version 26.0 was used to assess the reliability of the current study instrument using the Pearson Correlation Coefficient. While the reliability of the parameters has a global measure according to research sources and literature inserted.

Collection of Data: The researcher had gathered the data that was same as pilot study in measure . The data collection was collected in the following that be similar to pilot study.

Structure Building of the Instrument: To achieve the goals, a questionnaire was constructed by the researcher and adopted to match the study project's of data gathering objectives related to active cycle of breathing techniques . The content of questionnaire consists of four parts:

Part (I): Questionnaire Related to the Demographic Characteristics of the patients: This part is concerned with the collection of basic demographic data obtained from the patients. which consists of (8) items including: age, gender, educational level, marital status, Residence, Occupation , Chronic diseases , Smocking.

Part (II): Questionnaire Related to patient' Knowledge toward active cycle of breathing techniques: In this part included questionnaire there is in it text, some questions formulated in incorrect way to assess if the patients able differentiate it . The patient's answer was (yes / no) to all the statements to discover the extent of their knowledge about this technique.in the context of questionnaire, there are in correct questionnaire formulated in wrong way.

Note: the patient who not able to read and write , the researcher read the questionnaire to patients and the patient give the answer

Part (III): Observation Questionnaire (Checklist) Related to Patients' Practices active cycle of breathing techniques: In this part the researcher examines this active cycle as an application, if he is applying it during 3 observations of the 4 stages. The observation measured by if the patient applied stage will be ((applied)) while if the stage not do it will be ((don't applied)) . It measured before instruct the patient about techniques. The patient will give a degree according to applying of techniques . The aim from this part was to evaluate if the patient practice the techniques and the researcher want to evaluate the effect of active cycle of breathing techniques (ACBT) on patients status as general. The maxing of third and forth stage from techniques because the third stage consider as initiation and stimulate for cough , in other hand its occur consequently. The time expended in each observation almost 20 - 40 minute .

Note: if the patient applied the techniques for 1 times or no will be never , if applied techniques for 2 times will be some times ,while if applied for 3 times will be forever.

Part (IV): parameters related measurement of Spo2, Heart rate, respiratory rate and Borg Scale: When use active cycle of breathing technique, we assess effect of this technique on patients health as general and in specific assess effect of techniques on parameters that include spo2 measure, heart rate , respiratory rate and Borg scale measure(dyspnea level). We choose these parameter because consider as indicator for lung diseases .The following parameter measures were used for the purposes of the study:

- a) spo2 measure at the first day as the first measure (pre test) and at the five day as second measure (post test) measurement used by pulse oximeter from Shenzhen Jumber Medical equipment (munich Germany) model JPD-500E and anther pulse oximeter by china company.⁷

b) Heart rate measure at the first day as the first measure (pre test) and at the five day as second measure (post test) . The measure applied by pulse oximetry or measurement from radial pulse for one minute.⁸

C) Respiratory rate measure at the first day as the first measure (pre test) and at the five day as second measure (post test) . The measure applied for one minute by observing the chest increases and decreases in one minute or divided the pulse rate on 4 or the ratio of pulse to respiratory rate 4:1.⁸

D) Borg scale is assessment of dyspnea level for patient by asking the patient to verbalizes the rate dyspnea based on scale measure form 1 to 10 levels . In other hand measure the dyspnea by asking the patient to classify the dyspnea level from mild , moderate or sever , in the classification easily used and understood from patient from scale (1 to 10 levels). The first measure was at first day as pre test and second measure as posttest at five day.¹⁸

Note: in the second measure (post test) take this s measure after patient completely rested and measurements from pulse oximeter takes for one minute or after stable reading of device

RESULTS

This table displays that patients show poor level of knowledge during pre-test time (M±SD= 7.65±2.723) in which 52.5% of them are showing poor level. During the post-test time, 85% of patients show good level of knowledge regarding use of active cycle breathing techniques (M±SD= 15.75±1.750).

This table indicates that there is high significant difference in Patients' knowledge with regard to post-test time at p-value= .001 which reveals that instructional program was highly effective on patients' knowledge.

This table indicates that there is high significant difference in Patients' practices with regard to post-test time at p-value= .001 which reveals that instructional program was highly effective on patients' practices.

This table indicates that there are high significant relationship in SPo₂ , Respiratory Rate and Borg Scale Parameters with regard to P. value .001 for each them during pre-

test and post-test while there is a significant relationship in Heart Rate at P. Value .012 during pre-test and post-test.

Table (1): Distribution of Patients according to their Socio-demographic Characteristics

No	Characteristics	F	%	
1	Age	21 –30 year	3	7.5
		31 –40 year	4	10
		41 –50 year	8	20
		51 – 60 year	8	20
		61 ≤ year	17	42.5
	Total	40	100	
2	Gender	Male	27	67.5
		Female	13	32.5
		Total	40	100
3	Marital status	Married	38	95
		Unmarried	2	5
		Total	40	100
4	Level of education	Doesn't read and write	18	45
		Read and write	9	22.5
		Primary school	10	25
		Secondary school	1	2.5
		Institute/ College+	2	5
	Total	40	100	
5	Residency	Urban	14	35
		Rural	26	65
		Total	40	100
6	Occupation	Doesn't work	23	57.5
		Free work	10	25
		Employee	6	15
		Retired	1	2.5
		Total	40	100
7	Chronic illnesses	None	10	25
		Hypertension	5	12.5
		Diabetes mellitus	8	20
		More than one	17	42.5
		Total	40	100
8	Smoking	Yes	25	62.5
		No	15	37.5
		Total	40	100

No: Number, f: Frequency, %: Percentage

Table (2) Independent Sample T-test for Patients Knowledge with regard to Pre-test and Post-test (N=40)

Knowledge	Mean	SD	T	df	p-value	Sig.
Pre-test	7.65	2.723	13.867	78	.001	H.S
Post-test	15.75	1.750				

SD: Standard deviation, t: t-test, df: Degree of freedom, p: Probability, Sig.: Significance, HS: High Significant, N.S: Not Significant

Table (3) Independent Sample T-test for Patients' Practices with regard to Pre-test and Post-test (N=40)

Practices	Mean	SD	T	Df	p-value	Sig.
Pre-test	3.10	.304	7.973	78	.001	H.S
Post-test	6.48	1.414				

SD: Standard deviation, t: t-test, df: Degree of freedom, p: Probability, Sig.: Significance, HS: High Significant, N.S: Not Significant

Table(4) Independent Sample T-test for Parameters about Active Cycle Breathing Techniques with regard to Pre-test and Post-test (N=40)

Parameters		Mean	SD	T	df	p-value	Sig.
Spo ₂	Pre-test	92.20	3.428	7.432	78	.001	H.S
	Post-test	96.83	1.933				
Heart rate	Pre-test	87.08	12.751	2.565	78	.012	S
	Post-test	79.75	12.796				
Respiratory rate	Pre-test	22.08	3.141	4.579	78	.001	H.S
	Post-test	18.85	3.159				
Borg scale	Pre-test	3.60	2.262	6.325	78	.001	H.S
	Post-test	1.00	1.281				

SD: Standard deviation, t: t-test, df: Degree of freedom, p: Probability, Sig.: Significance, HS: High Significant, N.S: Not Significant

DISCUSSION

Discussion of the Distribution of the patients' Demographic Characteristics and Comparing between the pre-test and post-test of Study group (Table 4-1): The table (1) shows that the highest percentage among patients is with age 61 years and more (42.5%)²⁰ and (20%) of them are seen with age groups of 41-50 years and 51-60 years. The gender shows that 67.5% of patients are male and 32.5% of them are female. The marital status refers that most of the patients are married as seen among 95%²⁰ and

only 5% are still unmarried . Regarding level of education, the highest percentage is refers to 45% of those who doesn't read and write and 22.5% of them were read and write. The residency refers that 65% of patients are resident in rural areas while 35 are residents in urban areas. Regarding occupational status, more than half of patients are doesn't work (57.5%) and 25% of them are working free works. This finding related to chronic diseases, 42.5% of patients are reported they have more than one chronic illness.

Regarding smoking, 62.5% of patients are seen smokers while 37.5% of them are not smokers.

Discussion effect of the Knowledge and Practices for Patients about the Active Cycle Of Breathing Techniques (ACBTs): This results in table (2) explored there is highly significant for patient's knowledge concerning active cycle of breathing at respiratory isolation unit. The results of knowledge before instruct the patients about Active Cycle Breathing Techniques (ACBTs) during Pre-test and Post-test. They show poor level of knowledge during pre-test time while they show good level of knowledge during post-test time.

This results study agreed with Halim et al. (2018) stated that if pulmonary rehabilitation program are received, it will improve individuals' knowledge through the educational process of how to manage their diseases are a must and important.⁶

The study finding also conformed with Wade (2020) reported that instructional program included exercise, knowledge, psychosocial support, and education particularly about self-management, help rehabilitate patient about practices and knowledge for covid 19 management.¹⁷

Also the Study results agreed with Ezema et al.(2021) Showed that who receiving good understandable instructions about how to manage their principle health will appear good knowledge of COVID-19 pathology, positive knowledge and for the first precaution, their protective equipment and good training.³

The results of presented study in table (3) explored there is highly significant for patient's practices concerning active cycle of breathing at respiratory isolation unit. The results of practices before instruct the patients about Active Cycle Breathing Techniques during Pre-test and Post-test. They shows of patients show poor level of practices during pre-test time while they show good level of Practices during post-test time.

The study results agreed with Shen et al. (2021) stated in study that the researchers have combined exercise training with chest physiotherapy techniques applied to young patients with cystic fibrosis to improve their health practices that has resulted in significant improvements on sputum production, oxygen saturation, and short-term lung function.¹³

Also the study results agreed with Ferdous et al. (2020) that suggest the need for effective and tailored health education programs aimed at improving knowledge and practice manage, thereby leading to more favorable attitudes and to implementation and maintenance of safe practices.⁴

The findings of study also matched with Jiandani et al. (2020) reveled the patients need pulmonary rehabilitation program with education, counseling, tailored exercise program, and healthy nutrition along with telerehabilitation should be encouraged follow-up practices to improve quality of life.^{9,21}

Discussion the effect of active cycle of breathing techniques (ACBTs) on parameters (spo2, heart rate, respiratory and borg scale): Table (4) show that there are significant relationship in SPo2, hear rate Respiratory Rate and Borg Scale Parameters during use of active cycle of breathing techniques.

The study results conformed with Nirmalasari et al.(2019) reported that breathing exercises and motion active range applied to patients with CHF improve oxygen saturation resulted, increases gas exchange, lowers respiratory rate to normal limits.¹¹

Also study results conformed with Thenmozhi and Bindya Sophie (2021) reported that physiological parameters such as respiratory rate and hearth rate are improved after use of active cycle breathing technique.¹⁵

The finding of study also matched with Mohamed (2019) showed that there was a statistically significant improvement in heart rate (HR) and respiratory rate (RR) after breathing exercise intervention.¹⁰

Also the results of study coincided with Öner Cengiz et al. (2021) represented that the group patients use the deep breathing had a statistically significant higher SpO2 level and respiratory rate reaches normal limits in a short time.¹²

Also The finding of study agreed with Derakhtanjani et al.(2019) showed results of vital sign analysis revealed that the Heart Rate, blood oxygenation significantly increased at post intervention when we us active cycle of breathing techniques.²

The current study found that vigorous breathing exercise improves respiratory parameters in coronavirus patients, particularly the influence on oxygen saturation (spo2), heart rate, respiratory rate, and Borg scale (dyspnea measurement).Furthermore, the active cycle of breathing techniques(ACBTs) is not cost-effective; It can be performed by the patient with the help of his other treatments. Also, the active cycle of breathing techniques helps in mobilizing secretions and helps in re-expansion lung tissue. After using active cycle breathing techniques, It helped the patient improve correct breathing. On the other hand, the research contributed to providing an instructional program that strengthened and enriched the knowledge and practices of patients in benefiting from this technology at the level of health care and in their daily lives.

Recommendation:

1. It is recommended to use the active cycle of breathing techniques at least 1 or more depending on the patient's condition, with an emphasis on using this technique in addition to other physiotherapy techniques, especially that the epidemic is ongoing and must live with it.
2. Focus on using a larger sample and using it several times during the day. Studies have shown that Corona infection develops into shortness of breath and lack of oxygen, so it is recommended to use the breathing technique
3. It was used as a technique to correct breathing and clear the airways of thick sputum.

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