



“EFFECT OF ACTIVE CYCLE OF BREATHING TECHNIQUE ON DYSPNEA AND QUALITY OF LIFE IN POST-COVID 19 PATIENTS”

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ABSTRACT

BACKGROUND – Dyspnea after hospital discharge along with affected quality of life is most commonly seen in Post Covid 19 discharge patients. It causes a delay in recovery of the patient. In recent years, Active Cycle of Breathing Technique (ACBT) is very popular active breathing technique which is used to mobilize and clear pulmonary secretions, improve ventilation in lungs and improve effectiveness of cough. Dyspnea 12 questionnaire and World Health Organization Quality of Life – BREF (WHOQOL-BREF) is useful to check the effectiveness of a active cycle of breathing technique on dyspnea and quality of life.

AIM- To study the effect of Active cycle of breathing technique on dyspnea and quality of life in post covid 19 patients

METHOD – A total number of 100 patients both male and female aged 20 to 40 years discharged from hospital within past 15 days having dyspnea and cough were included in the study. The intervention comprises of 1 to 2 daily sessions of ACBT depending upon severity of the symptoms for 1 week. Pre and post intervention data will be compared using D-12 Questionnaire and WHOQOL-BREF scale.

OUTCOME MEASURE- World Health Organization Quality of Life-BREF (WHOQOL-BREF),
Dyspnea-12 Questionnaire

RESULT- The level of dyspnea was significantly reduced and quality of life was significantly improved post treatment sessions with ACBT. Post Dyspnea-12 questionnaire score after ACBT was significantly smaller compared with pre-treatment score ($p=0.041979$). Post WHOQOL (physical health) score was significantly larger compared to pre-treatment score ($p=0.000204$). Post WHOQOL (psychological) score was significantly larger compared to pre-treatment score ($p=0.000122$). Post WHOQOL (social relationship) score was significantly larger compared to pre-treatment score ($p=0.000375$). Post WHOQOL (environmental) score was significantly larger compared to pre-treatment score ($p=0.049278$).

CONCLUSION- This study supported alternate hypothesis i.e., there was a significant effects of Active cycle of breathing technique on dyspnea and quality of life in Post covid 19 patients. This study concluded that, active cycle of breathing technique was an effective technique in reducing dyspnea and improving quality of life.

KEYWORDS- Post-covid 19, Active cycle of breathing technique (ACBT), Dyspnea-12 questionnaire (D-12 Q), World health organization quality of life – BREF scale (WHOQOL-BREF)

INTRODUCTION

The coronavirus illness (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was initially diagnosed in December 2019 in Wuhan, China, and has since spread to numerous provinces across the country. The World Health Organization (WHO) had registered 3,759,967 positive COVID-19 cases as of May 8th, 2020, and the death toll from COVID-19 had reached 259,474 worldwide.^[1]

SCENARIO IN INDIA

On January 30th, 2020, the first SARS-CoV-2 positive case in India was reported in Kerala. SARS-CoV causes SARS, whereas COVID-19 is caused by SARS-CoV-2. Maharashtra, Delhi, and Gujarat were reported to be COVID-19 hotspots on May 8th, 2020, with 17,974, 5,980, and 7,012 confirmed cases, respectively. On March 22nd, 2020, the "Janata curfew" (14-hour lockdown) was imposed to impose social distance. A new lockdown began on March 25th, 2020, for 21 days, and was extended until May 3rd, 2020. However, due to a rising number of positive cases, the lockdown has been prolonged for the third time, until May 17th, 2020. SARS-CoV-2 has a greater binding affinity for host cell receptors than SARS-CoV-1.^[1]

Evidence supports that symptoms associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing COVID-19 are highly heterogeneous and range from no symptoms to minimal (cough, sneezing, or sore throat), mild (fever, rhinorrhoea, dyspnoea, or diarrhoea), or severe (pneumonia, acute respiratory distress syndrome, septic shock, or systemic multiple organ failure) symptoms. Another meta-analysis focused on respiratory symptoms also reported that fatigue and dyspnoea are the most prevalent respiratory post-COVID-19 symptoms in hospitalized patients with a prevalence of 52% and 37%, respectively, between 3 weeks and 3 months after hospital discharge.^[2]

Dyspnea is an independent predictor of morbidity and mortality in general population and is associated with reduced functional capacity and adverse health related quality of life. Dyspnea is a common persistent symptom across varying degree of initial covid 19 severities.^[3] Covid-19 has an impaired effect on HRQOL (Health related quality of life). The patients who had been treated in hospital for covid-19 related pneumonia and severe respiratory failure have an impaired HRQOL at discharge phase.^[4]

According to recent findings, certain people may have medical issues, and 11 percent to 24 percent of Covid-19 patients may experience long-term symptoms even three months after their disease began. Because of the factors mentioned, Covid-19 may have a negative impact on the health-related quality of life (HRQOL) of infected people in the short and long term.^[5]

HRQOL is a broad term that encompasses areas such as physical, mental, social, and emotional well-being. A variety of HRQOL measuring instruments are available, some of which are generic and others of which are condition specific. Generic HRQOL tools (e.g. SF-36 (36-item Short-Form Health Survey), SF-6D (Short-Form 6 Dimension) derived from the SF-36, and EQ-5D (EuroQol- 5 Dimension)) are widely used to assess multi-dimensional domains of the health and well-being of different populations. The following are some examples of disease-specific quality of life assessment measures for pulmonary disease - St. George Respiratory Questionnaire (SGRQ) and Clinical COPD Questionnaire (CCQ), which have been used in HRQOL assessment of Covid-19 patients^[6]

Cough is one of the most presenting symptoms of covid 19, along with loss of taste and smell. cough can persist for weeks and months after SARS-CoV-2 infection along with other symptoms such as dyspnea, chronic fatigue, cognitive impairment.^[7] Lung parenchymal changes is commonly seen along with lung fibrotic changes in 10-20% of adult patients with covid-19. Increase in sensitivity of cough reflex could be due to fibrotic changes in the lung parenchyma.^[8] In a multicenter observational cohort study done in 1250 COVID-19 survivors in Michigan, USA, the patients who responded to the telephone survey reported new or worsening cough at 2 months after

discharge. A online survey reported 20-30% cough in still symptomatic patients 2-3 months after the onset of symptoms of covid-19. ^[7]

For assessing the quality of life, WHOQOL questionnaire is most commonly used. The WHOQOL-BREF is a popular short version because its brevity minimizes participant response burden and hence makes it easier to utilize in conjunction with other measures. In comparison to SF364, the WHOQOL-BREF has great cross-cultural adaptability. This cross-culturally valid tool takes into account physical, psychological, social, and environmental factors. ^[9]

The Dyspnea Scale, developed by the Medical Research Council, is another prominent measure for assessing dyspnea. However, it is only activity specific, and it has a limited relationship with patients physiological and functional distress, making it unsuitable for multidimensional breathlessness assessment. The Dyspnea-12 (D-12) Questionnaire is a simple patient-reported measure for assessing dyspnea severity. The physical and psychological elements of breathlessness are measured using 12 descriptors. The D-12 has established its validity and reliability in COPD, asthma, interstitial lung disease and pulmonary hypertension, but its psychometric properties have not yet been assessed in post-covid 19 patients. ^[10]

Passive Airway clearance was a main physiotherapy technique for airway clearance till the mid-1970s, with the therapist prodding manual techniques such as percussion, vibration and shaking with the patients appropriately positioned. But it showed some hazardous effects such as hemoptysis, resultant poor compliance and a chronic cause of disease. Airway clearance techniques are considered as a integral component of airway management. ^[11]

Active cycle of breathing technique is widely used and it consists of components such as Breathing control, Thoracic expansion exercise and Forced expiratory technique. The component includes breathing control for 10-15 seconds, thoracic expansion exercise and forced expiration (three huffs) in a set cycle. Also ACBT is a very simple technique and at no expenses. ACBT has significant and remarkable benefits on exercise tolerance and functional capacity via 6 minute walk test and also on shortness of breath on Bronchiectasis. ^[12]

In order to facilitate excessive secretion from the distal lung, an active cycle of breathing technique (ACBT) is performed. It's a combination of exercises. ACBT is done in phases. Control breath, which can reduce airway narrowing and promote oxygen saturation, thoracic expansion exercises, which can improve alveolar ventilation and mobile secretion, and forced expiratory technique should all be included in each cycle of ACBT (FET). Depending on the patient's health, the frequency and intensity of exercise may vary, but each component must be present. ^[12]

To the author's best knowledge, no review study was done to evaluate the effectiveness of active cycle breathing technique in post-covid 19 patients using dyspnea-12 Questionnaire and World Health Organization Quality of Life (WHOQOL).

AIM

To study the effect of Active Cycle Breathing Technique (ACBT) on Dyspnea and Quality of life in post-covid 19 patients

OBJECTIVES

- To find out the effect of Active Cycle Breathing Technique (ACBT) on Dyspnea using Dyspnea-12 Questionnaire (D-12 Q) in post-covid 19 patients
- To find out the effect of Active cycle breathing technique (ACBT) on Quality of life using WHOQOL-BREF Questionnaire in post-covid 19 patients.

MATERIAL AND METHODOLOGY

Ethical clearance was obtained from institutional ethical committee. Permission from the tertiary health care hospitals were obtained. Subject were selected on basis of inclusion and exclusion criteria. This study included Age group of 20-40 years, both male and female subjects, Post discharge subjects from hospital who were COVID-19 negative proven by reverse transcription-polymerase chain reaction (RT-PCR) testing, subjects who were willing to participate, BORG SCALE (9 and above) and Cough (on numerical rating scale - ≥ 4). Subjects with cardiac conditions like coronary artery disease, congestive cardiac failure, Myocardial infarction, respiratory conditions (Asthma, Chronic bronchitis, emphysema), any recent surgeries, Musculoskeletal complications (such as rib fracture, lower limb fracture), Neurological conditions (such as epilepsy, cerebral palsy) were excluded. Written consent form was filled. This interventional study was conducted in tertiary care hospitals of Miraj taluka, 100 post covid 19 discharge patients were taken of age group between 20 to 40 years of both gender, and their breathlessness severity was checked using BORG scale and also the severity of Cough using a Numerical rating scale. World Health Organization Quality of Life Questionnaire (WHOQOL Q) and Dyspnea 12 Questionnaire was filled before starting the protocol. A one week protocol was set, sessions depending upon the severity of the condition of patient. After completion of one week, again the questionnaire was filled and the values were noted. Data analysis was performed using Statistical Package for the Social Sciences [SPSS] Software.

Paired t-Test was used for pre and post intervention for both Dyspnea 12 Questionnaire and WHOQOL-BREF Questionnaire

ACBT consists of three main stages

- Breathing control
- Thoracic expansion exercises
- Forced expiratory techniques

1. Breathing control

- Breathe in and out gently through your nose.
- While breathing out through your mouth use breathing control with ‘pursed lip breathing’
- Try to let go of any tension in your body with each breath out and keep shoulder relaxed
- Gradually try to make the breaths slower
- Try closing your eyes to help to focus on your breathing and to relax.

2. Chest expansions (In Standing)

- Breath gently at normal rate and depth using the lower chest (breathing control).
- Breath in slowly and deeply using the lower chest then pauses.
- Breath out fully but not forcefully.
- Repeat for a further two breaths. Return to breathing control.
- Take three further slow deep breaths.
- Return to breathing control.

3. Forced expiratory technique: -

- Take a slightly bigger than normal breath in.
- keep your mouth open
- Breathe out more forcefully using your abdominal muscles to assist. This should sound like a forced sigh. This is described as huffing.
- Repeat for a further two breaths.
- Return to breathing control.
- Cough to clear sputum if necessary.
- Return to breathing control until you are ready to begin another cycle.

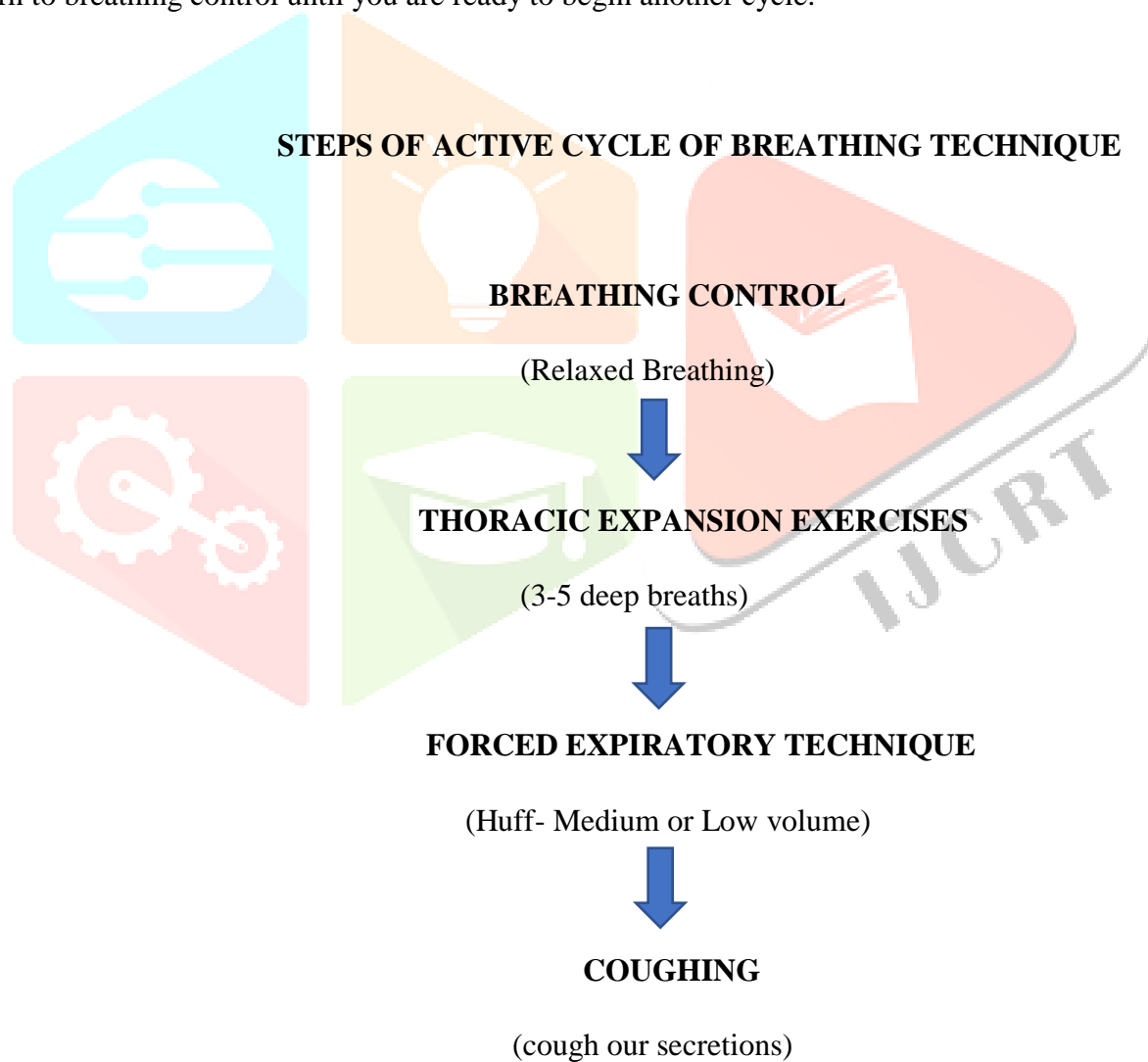


FIG 1 – Flow chart of steps of ACBT



FIG 2 - Active cycle of breathing technique on patient

RESULT

Data analysis was performed using Statistical Package for the Social Sciences [SPSS] Software. The level of significance for pre and post dyspnea 12 Questionnaire and World health organization quality of life scale within the group was calculated using paired t test.

DYSPNEA 12

GROUP	D-12 Q	
	Pre	post
Mean	21.16	2.22
SD	± 5.26	
Mean Difference	18.94	
Percentage of Improvement	89.50	
p-value	0.041979	
S	S	

SD – Standard deviation p-value – probability value S – Significance

Tab 1 – Mean, SD and p-value of D-12 Q pre and post treatment

WHOQOL

GROUP	WHOQOL (physical health)	
	Pre treatment	post treatment
Mean	52.26	74.08
SD	± 7.86	
Mean Difference	21.82	
Percentage of Improvement	29.45	
p-value	0.000204	
S	S	

SD – Standard deviation

p-value – probability value

S – Significance

Tab 2 – Mean, SD and p-value of WHOQOL (physical health) pre and post treatment

GROUP	WHOQOL (psychological)	
	Pre treatment	post treatment
Mean	44.65	61.32
SD	± 7.36	
Mean Difference	16.67	
Percentage of Improvement	27.18	
p-value	0.000122	
S	S	

SD – Standard deviation

p-value – probability value

S – Significance

Tab 3 – Mean, SD and p-value of WHOQOL (psychological) pre and post treatment

GROUP	WHOQOL (social relationship)	
	Pre treatment	post treatment
Mean	47.07	58.11
SD	± 8.55	
Mean Difference	11.04	
Percentage of Improvement	18.99	
p-value	0.000375	
S	S	

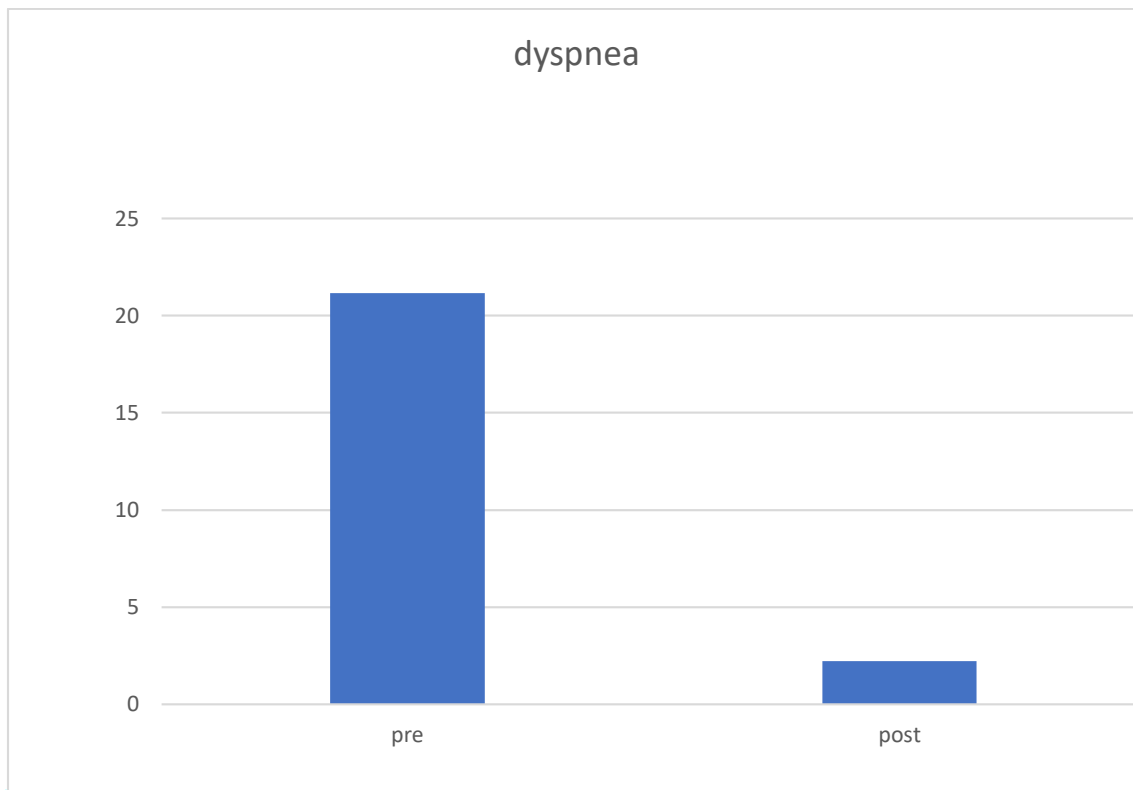
SD – Standard deviation p-value – probability value S – Significance

Tab 4 – Mean, SD and p-value of WHOQOL (social relation) pre and post treatment

GROUP	WHOQOL (Environmental)	
	Pre treatment	post treatment
Mean	33.66	72.47
SD	± 3.05	
Mean Difference	38.81	
Percentage of Improvement	53.55	
p-value	0.049278	
S	S	

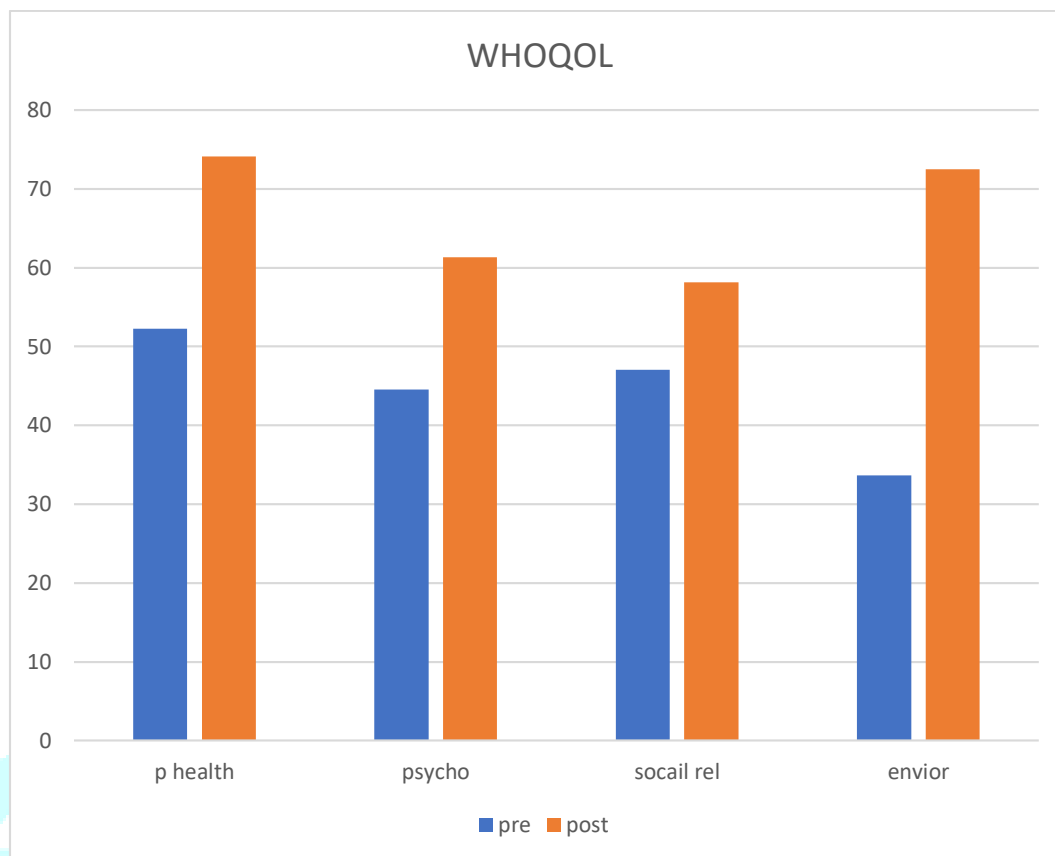
SD – Standard deviation p-value – probability value S – Significance

Tab 5 – Mean, SD and p-value of WHOQOL (environment) pre and post treatment



Graph 1 : Pre and Post within group analysis by using Paired sample t test of D-12 Questionnaire

From the above within groups analysis using paired sample t test, it is observed that dyspnea 12 questionnaire and WHOQOL scale mean value indicated changes post treatment. The mean value of Dyspnea 12 questionnaire before intervention is 21.16 and after intervention is 2.36 which has shown improvement in dyspnea following ACBT. Clinically, there is an effect of ACBT on dyspnea in post covid 19 patients



Graph 2 : Pre and Post within group analysis by using Paired sample t test of WHOQOL

The mean value of physical health domain of WHOQOL before intervention is 52.26 and after intervention is 74.08 and also mean value of psychological domain before intervention is 44.65 and after intervention is 61.32, mean value of social relationship domain before intervention is 47.07 and post intervention is 58.11 and the mean value of environment domain before intervention is 33.66 and after intervention is 72.47 which has shown a improvement in all the four domains. Clinically, there is an effect of ACBT on Quality of life in post covid 19 patients.

OUTCOME	<i>p-value</i>
D 12 QUESTIONNAIRE	0.041979
WHOQOL PHYSICAL HEALTH	0.000204
PSYCHOLOGICAL	0.000122
SOCIAL RELATIONSHIP	0.000375
ENVIRONMENT	0.049278

Tab.6 : Significance of the data

From the above within groups analysis using paired sample t test, it is observed that *p-value* of dyspnea 12 questionnaire after intervention is 0.041979, *p-value* of WHOQOL physical health domain after intervention is 0.000204, *p-value* of psychological domain after intervention is 0.000122, *p-value* of social relationship domain after intervention is 0.000375 and *p-value* of environmental domain after intervention is 0.049278 which is highly significant.

Thus reference to the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with *p-value* is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention. From the table 2, it is observed that within group analysis is significant for Dyspnea 12 questionnaire and WHOQOL Questionnaire

DISCUSSION

This study finding helps us to understand that active cycle of breathing technique shows significant effect in reducing the dyspnea and also improving the quality of life of the patient. It showed improvement in all the aspects of Physical health, psychological, environmental and social relationship.

Covid 19 is increasingly becoming cause of morbidity and mortality (S. Udhaya Kumar et. al) conducted a study on rise and impact of covid 19 in India. Corona virus is responsible for both SARS and Covid 19 diseases, they affect the respiratory tract and has caused major disease outbreak worldwide. The central and state governments are taking several measures to formulate a protocol to achieve a goal. Hence, the present study was designed to find out the effect of Active cycle of breathing technique on dyspnea and quality of life in post covid-19 patients.

(Vineet chopra et.al) had conducted a study on post covid 19 patients after sixty days of post discharge and found that there were cardiopulmonary symptoms such as cough and dyspnea, 2 months after discharge cough was most predominant feature. (Mandal S et.al) found out the prevalence of cough after COVID-19 and indicated 7-10% of patients who recovered from COVID-19 pneumonia might suffer from cough 2 months after discharge.

Dyspnea is the most common symptom seen in post-covid 19 patients after hospital discharge along with Cough, which is also commonly seen in most patients following discharge, which mainly distress the patient (Woo-Jung Song et.al). A study by Carfi and colleagues was the first to describe persistent symptoms in patients after Covid-19. In a post covid cohort of 143 patients from a hospital in Italy, 125 (87.4 %) reported struggling with symptoms – 76 (53.1 %) reported fatigue, 62 (43.4 %) dyspnea, and 23 (16.0 %) cough – 2 months after discharge.

H.M.R.K.G Nandasena et. al carried out a database study where he assessed the Quality of life of covid-19 patients following discharge and recovery. He concluded in his study that the quality of life of the Post Covid 19 patients was significantly impacted, regardless of time elapses since discharge or recovery.

There is a study by Shereen Hamed Elsayed et al. which aimed to determine the effect of active cycle breathing technique on functional capacity in adults with productive Bronchiectasis. This study showed that ACBT had a significant and remarkable benefits on exercise tolerance and functional capacity. This study also showed that ACBT was helpful in mobilizing secretions which was also seen in our study.

Kulkorni 2012 compared the effect of autogenic drainage and pursed lip breathing versus active cycle of breathing in hospitalized bronchiectasis patients. Pulmonary functions (FEV1, FEV1/FVC) were assessed and discussed using Medical Research council scale before and after treatment sessions. The results concluded that ACBT is better used than autogenic Drainage and pursed lip breathing in bronchiectasis patients and is easy adaptable by patients.

Paneeth et al., 2012 conducted a randomized study for 30 patients with bronchiectasis, is patients treated with active cycle of breathing technique and the other is treated with postural drainage. Pre and post evaluation were done by FVC, FEV1, PEFr and SPO2 by using pulmonary function test and pulse oxymeter. The study concluded that both of postural drainage and ACBT have significant effect in clearance of airways and improving the pulmonary function in bronchiectasis but ACBT has the better effect than postural drainage in airway clearance, FVC, FEV1 and SPO2.

The present study was designed to investigate the effect of active cycle of breathing technique on dyspnea and quality of life in post covid 19 patients. Hundred post covid 19 discharge patients were taken of age group between 20 to 40 years of both gender, and their breathlessness severity was checked using BORG scale and also the severity of Cough using a Numerical rating scale. World Health Organization Quality of Life Questionnaire (WHOQOL Q) and Dyspnea 12 Questionnaire was filled before starting the protocol. A one week protocol was set, sessions depending upon the severity of the condition of patient. After completion of one week again the questionnaire was filled and the values were noted. This study shows that Active cycle of breathing technique (ACBT) had an significant effect on dyspnea and also assisted in mobilizing secretions. Also ACBT showed an significant improvement in quality of life.

CONCLUSION

This study supported alternate hypothesis i.e. there was an significant effect of Active cycle of breathing technique on dyspnea and quality of life in Post covid 19 patients. This study concluded that, active cycle of breathing technique was an effective technique in reducing dyspnea and improving quality of life.

LIMITATIONS

1. Short duration of treatment protocol
2. Male and female comparison not done
3. Elder age group not included in the study

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