



## A CLINICAL STUDY TO EVALUATE THE EFFECT OF SET OF PRANAYAMA AND BREATHING EXERCISES IN POST COVID-19 PATIENTS

Vijayalaxmi S Kamatar<sup>1</sup>, Srinidhi Dhanya B.S<sup>2</sup>, Sandesh Kumar Shetty<sup>3</sup>

P.G Scholar<sup>1</sup>, Assistant professor<sup>2</sup>, Associate professor<sup>3</sup>, Department of Swasthavritta, SDM college of Ayurveda, Udupi

Corresponding Author: [vijayalaxmi96sk@gmail.com](mailto:vijayalaxmi96sk@gmail.com)

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### ABSTRACT

Although there had been enormous development in the field of medical science presently, the importance of ancient methods of preventing diseases could not be ignored even in 21st century. Communicable diseases continue to be a major public health problem in India. The root-cause of Janapadodhwansa is Adharma which in this context means non-performance of one's duties with honesty or as per rules of the nature or country. Adharma arises due to Pragnaparadha (intellectual errors occurring knowingly). Janapadodhwansa can be prevented and controlled by using Panchakarma i.e., purification procedures like vamana (emesis), virechana (purgation), vasti (medicated enema) and nasya (using medicines through nasal route), rasayana and obeying the sadavritta (code of conduct). COVID-19 is a great nightmare to mankind. Recent studies suggest that 75.4% patients had abnormal pulmonary function tests even after the discharge from hospital. These changes may also affect the quality of life of the individuals. Improving the lung capacity may help in normalizing the pulmonary functions.

In this regard *pranayama* and deep breathing techniques plays a great role to restore lung capacity in COVID-19 recovery process. *Pranayama* improves overall performance of the body.

**Keywords:** *Sankramaka roga*, Covid-19, Pranayama, Breathing exercises

## INTRODUCTION

Infectious or communicable diseases can be defined as an illness caused by another living agent or its product that can be spread from one person to another. Low vaccination rates, poor nutrition, age (young & elderly) and immunosuppression are the factors which contribute to risk of infection<sup>1</sup>.

COVID-19 is a great nightmare to mankind. The disease has spread worldwide, leading to an ongoing pandemic. As of 19th February 2021, about 11.08 crore cases were reported globally with 24,53,582 deaths.

Patients with COVID-19 tend to be sicker for much longer than other patients with respiratory related illness. In post covid-19 patients the lung capacity is also affected, which makes them to feel difficulty for breathing or may result in shallow breathing<sup>2</sup>. These changes may also affect the quality of life of the individuals. Improving the lung capacity may help in normalizing the pulmonary functions.

In this regard *pranayama* and deep breathing techniques plays a great role to restore lung capacity in COVID-19 recovery process. *Pranayama* makes efficient use of abdominal and diaphragmatic muscles and improves the respiratory apparatus. Deep breathing can help restore diaphragm function and lung capacity<sup>3</sup>.

Deep breathing exercises can also lessen the feeling of anxiety and stress in patients who have experienced moderate to severe symptoms<sup>4</sup>.

Unfortunately, modern medicines which are suggested in COVID-19 does not remove the root cause of diseased condition instead it only relieves the symptoms. *Pranayama* and breathing exercises fastens lung healing by restoring the body's lost internal harmony and by focusing on stress reduction and bringing life style changes.

The word *pranayama* is comprised of 2 words *prana* means life, wind, energy or respiration and *aayama* means to lengthen, to expand or to stretch. It is not merely breath control, but a technique through which the quantity of *prana* in the body is activated to a higher frequency<sup>5</sup>.

*Pranayama* strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extent and muscles are made to work to maximal extent. *Pranayama* like *naadishuddhi*, *bhramari*, *bhastrika* and *kapaalabhaati* helps in bringing the sympathetic and parasympathetic nervous system into harmony. Through breathing we can influence the nervous system. *Pranayama* allows bronchial dilatation by correcting abnormal breathing pattern and reducing muscle tone of respiratory muscles<sup>6</sup>.

Respiratory system is a bridge between the conscious and subconscious, or the body and mind. Breathing exercise helps in increasing the air build up in the lungs and diaphragm. It increases the lung capacity which gives more breathing space<sup>7</sup>.

### OBJECTIVES OF THE STUDY:

#### Primary objectives

□□ To study the effect of set of *pranayama* and breathing exercises in decreased lung capacity

#### Secondary objectives

□□ To study the effect of set of *pranayama* and breathing exercises in post covid-19 patients.

### MATERIALS AND METHODS

40 Subjects fulfilling diagnostic and inclusion criteria will be selected and randomly allocated for the study.

#### Diagnostic Criteria

□ Reduced lung capacity <400 L/min for women, <700L/min for men and who were tested Covid-19 positive and recovered.

#### Inclusion Criteria

1. Subjects aged between 20-50years who were tested Covid-19 positive and recovered (Minimum 15 days after tested positive).
2. Subjects who are willing to give consent for the following treatment.

#### Exclusion Criteria

1. Subjects with Asthma
2. Subjects with other COPD
3. Subjects with congenital anomalies of the lungs.
4. Other infective conditions like Tuberculosis and malignant conditions of lungs

**PLAN OF STUDY:**

**SAMPLING METHOD**

Simple Random sampling method

**Study Design**

□ **Group A ( Study group)** -It is a trial group in which the subjects will be taught with set of *pranayama* and breathing exercises like

- *Naadi shuddhi pranayama*
  - *Bhramari pranayama*
  - Hands in and out breathing
  - Hands stretch breathing
  - Ankle stretch breathing
  - Tiger breathing
  - *Kapalabhaati*
  - *Bhastrika*
  - Dog breathing
  - Rabbit breathing
- } each 9 cycles
- } each 5 cycles
- } each 20-30 strokes for 3 cycles

For a total duration of 40 minutes.

□ **Group B (Control group)** – This group is not administered with any kind of therapies. It will be kept as a reference point for measuring lung capacity.

**STUDY PERIOD**

□ 60 days, Subjects are reviewed every 15 days during the study period.

**ASSESSMENT CRITERIA**

□ Changes of both the groups will be collected and data will be analysed.

□ 40 Subjects fulfilling the diagnostic criteria and inclusion criteria will be randomly divided into 2 groups each comprising 20 patients.

**SUBJECTIVE CRITERIA**

□ Change in quality of life felt by the subjects which is assessed by WHO Quality Of Life Scale.

**OBJECTIVE CRITERIA**

1. Changes in the lung capacity which is measured by peak flow meter.
2. Changes in duration of inhalation, retention of breath and exhalation (during blowing of *shankha*, *OM-kara* chanting and maximum retention of breath)
3. Measurement of SPO2

**OBSERVATIONS AND RESULTS:**

Effect on objective criteria within the group is tested with Paired t test- Group A:

Parameters	Mean	Std. deviation	Std error mean	Mean difference	%	T	P value
Lung capacity BT	399.33	52.97	9.67	116.33	29.04	22.57	.000
Lung capacity AT	515.66	63.28	11.55				
SpO2% BT	92.56	5.46	.99	4.86	5.25	4.90	.000
SpO2% AT	97.43	.89	.16				
Duration of inhalation – BT	3.80	.55	.100	3.46	91.05	18.83	.000

Duration of inhalation – AT	7.26	1.17	.214				
duration of retention of breath -BT	4.53	.62	.11	.133	2.93	19.97	.000
duration of retention of breath -AT	7.93	1.25	.22				
duration of OM kara chanting -BT	5.10	.75	.13	3.30	64.70	18.29	.000
duration of OM kara chanting -AT	8.40	1.22	.22				
Duration of shankha blowing BT	6.16	.74	.13	3.86	62.66	17.71	.000
Duration of shankha blowing AT	10.03	1.49	0.27				

Effect on objective criteria within the group is tested with Paired t test- Group B:

Parameters	Mean	Std. deviation	Std error mean	Mean difference	%	T	P value
Lung capacity BT	397.66	41.07	7.49	6.66	1.67	1.39	.174
Lung capacity AT	404.33	52.23	9.53				
SpO2% BT	93.53	.68	.12	.300	0.32	1.32	.194
SpO2% AT	93.83	1.31	.24				
Duration of inhalation – BT	3.36	.49	.08	.333	9.91	2.06	.048
Duration of inhalation – AT	3.70	1.08	.19				
duration of retention of breath -BT	4.13	.57	.10	.133	3.22	.84	.403
duration of retention of breath -AT	4.26	.90	.16				
duration of OM kara chanting -BT	4.00	.52	.09	.03	0.75	1.43	.161
duration of OM kara chanting -AT	4.20	1.12	.20				
Duration of shankha blowing BT	4.00	.52	.09	.03	0.75	1.43	.161
Duration of shankha blowing AT	4.20	1.12	.20				

Objective parameters are assessed between the groups with Un-paired T test

Lung capacity	Group	Difference in mean	Unpaired t test			
			S.D	S.E.M	T	P
BT-AT	A	54.33	16.67	3.04	15.60	.000
	B	6.66	26.17	4.77		
SpO2%						
BT-AT	A	3.03	5.35	.97	4.49	.000

	B	.30	1.23	.22		
Duration of inhalation						
BT-AT	A	2.13	.77	.14	12.80	.000
	B	.33	.88	.16		
Duration of retention of breath						
BT-AT	A	1.93	.69	.12	14.10	.000
	B	.13	.86	.15		
Duration of OM kara chanting						
BT-AT	A	2.10	.80	.14	13.61	.000
	B	.20	.76	.13		
Duration of Shankha blowing						
BT-AT	A	2.03	.71	.13	12.90	.000
	B	.20	.99	.18		

**SUBJECTIVE CRITERIA**

Change in quality of life felt by the subjects which is assessed by WHO Quality Of Life Scale.

**Not at all -1, Not much -2, Moderately -3, A great deal -4, Completely -5**

Q1.	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Do you get the kind of support from others that you need					

**Very dissatisfied-1, Dissatisfied-2, Neither satisfied nor dissatisfied-3, Satisfied-4, Very satisfied-5**

Q2.	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
How would you rate your quality of life					

**Not at all-1, A little-2, A moderate amount-3, Very much-4, An extreme Amount-5**

	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Q3. To what extent do you feel that pain prevents you from doing what you need to do					
Q4. How much do you need any medical treatment to function in your daily life?					
Q5. How much do you enjoy life?					
Q6. To what extent do you feel your life to be meaningful?					
Q7. How well you able to concentrate?					
Q8. How safe do you feel in your daily life?					
Q9. How healthy is your physical environment?					

**Not at all-1, A little-2, Moderately-3, Mostly-4, Completely – 5**

	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Q10. Do you have enough energy for everyday life?					
Q11. Are you able to accept your bodily appearance?					

Q12. Have you enough money to meet your needs?					
Q13. How available to you is the information that you need in your day-to-day life?					
Q14. To what extent do you have the opportunity for leisure activities?					

**Very poor-1, Poor-2, Neither poor nor good-3, Good-4, Very good-5**

	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Q15. How well are you able to get ground?					

**Very dissatisfied-1, dissatisfied-2, neither satisfied nor dis satisfied-3, satisfied-4, very satisfied-5**

	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Q16. How satisfied are you with your sleep?					
Q17. How satisfied are you with your ability to perform your daily activities?					
Q18. How satisfied are you with your capacity for work?					
Q19. How satisfied are you with yourself?					
Q20. How satisfied are you your personal relationships?					
Q21. How satisfied are you with your sex life?					
Q22. How satisfied are you with the support you get from your friends?					
Q23. How satisfied are you with the conditions of your living space?					
Q24. How satisfied are you with your access to health services?					
Q25. How satisfied are you with your transport?					

**Never-1, Seldom-2, Quite often-3, Very often-4, Always-5**

	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
Q26. How often do you have negative feelings such as mood swings, despair, anxiety, depression					

**Very poor-1, Poor-2, Neither poor nor good-3, Good-4, Very good-5**

Q27.	0 <sup>th</sup> day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day	60 <sup>th</sup> day
How satisfied are you with your health					

Subjective Parameters Tested Within the Group By Wilcoxon's Sign Rank Test

Groups	BT	AT	Intpretation
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Q1 Mean			
A	3.20	4.00	HS
B	2.80	2.80	NS
Q2 Mean			
A	3.20	4.53	HS
B	2.80	2.66	NS
Q3 Mean			
A	3.33	4.56	HS
B	2.66	2.66	NS
Q4 Mean			
A	2.26	1.60	HS
B	2.50	2.50	NS
Q5 Mean			
A	1.73	1.60	NS
B	1.86	1.86	NS
Q6 Mean			
A	2.96	3.86	HS
B	2.30	2.33	NS
Q7 Mean			
A	3.43	4.40	HS
B	2.83	2.83	NS
Q8 Mean			
A	3.13	4.80	HS
B	2.36	2.36	NS
Q9 Mean			
A	3.93	3.93	NS
B	3.40	3.43	NS
Q10 Mean			
A	3.40	4.10	HS
B	2.96	2.96	NS
Q11 Mean			
A	3.10	4.53	HS
B	2.80	2.80	NS
Q12 Mean			
A	3.63	4.66	HS
B	3.26	3.26	NS

Groups	BT	AT	Intrepretation
Q13 Mean			
A	4.13	4.13	NS
B	3.36	3.36	NS
Q14 Mean			
A	3.53	3.96	S
B	3.06	3.06	NS
Q15 Mean			
A	3.03	3.23	S
B	2.56	2.56	NS
Q16 Mean			
A	3.10	4.30	HS
B	2.73	2.73	NS
Q17 Mean			
A	2.90	4.46	HS
B	2.50	2.50	NS
Q18 Mean			
A	3.20	9.10	HS
B	2.83	2.83	NS
Q19 Mean			
A	3.36	4.50	HS
B	2.76	2.76	NS
Q20 Mean			
A	3.80	4.83	HS
B	3.00	3.00	NS
Q21 Mean			
A	3.53	4.63	HS
B	2.80	2.80	NS
Q22 Mean			
A	1.86	2.33	HS
B	2.43	2.43	NS
Q23 Mean			
A	3.46	4.20	HS
B	2.96	2.96	NS
Q24 Mean			
A	3.83	3.86	NS
B	3.23	3.23	NS
Q25 Mean			
A	3.70	3.73	NS
B	2.83	2.83	NS
Q26 Mean			
A	3.76	3.73	NS
B	2.93	2.93	NS
Q27 Mean			
A	2.90	1.73	HS
B	3.30	3.30	NS



### Subjective Parameters Tested between the group by Man Whitney Test

Groups	Mean Rank		Z Value	P Value
	A	B		
	Q1 Mean			
BT-AT	42.50	18.50	6.27	.000
	Q2 Mean			
BT-AT	44.65	16.35	6.89	.000
	Q3 Mean			
BT-AT	45.00	16.00	7.11	.000
	Q4 Mean			
BT-AT	20.50	40.50	5.43	.000
	Q5 Mean			
BT-AT	28.50	32.50	1.70	0.08
	Q6 Mean			
BT-AT	43.50	17.50	6.67	.000
	Q7 Mean			
BT-AT	44.0	17.0	6.86	.000
	Q8 Mean			
BT-AT	42.50	18.50	55.50	.000
	Q9 Mean			
BT-AT	33.0	28.0	1.78	0.07
	Q10 Mean			
BT-AT	41.0	20.0	5.63	.000
	Q11 Mean			
BT-AT	45.0	16.0	7.04	.000
	Q12 Mean			
BT-AT	44.50	16.50	7.04	.000
	Q13 Mean			
BT-AT	30.50	30.50	.00	1.00
	Q14 Mean			
BT-AT	37.0	24.0	4.04	.000
	Q15 Mean			
BT-AT	33.50	27.50	2.56	.010
	Q16 Mean			
BT-AT	45.0	16.0	7.14	.000
	Q17 Mean			
BT-AT	45.0	16.0	7.14	.000
	Q18 Mean			
BT-AT	45.0	16.0	7.03	.000
	Q19 Mean			
BT-AT	44.50	16.50	6.90	.000
	Q20 Mean			
BT-AT	44.50	16.50	7.04	.000
	Q21 Mean			
BT-AT	45.0	16.0	7.23	.000

Q22 Mean				
BT-AT	38.28	22.50	4.75	.000
Q23 Mean				
BT-AT	41.0	20.0	5.61	.000
Q24 Mean				
BT-AT	31.0	30.0	1.00	.317
Q25 Mean				
BT-AT	31.0	30.0	1.00	.317
Q26 Mean				
BT-AT	29.67	31.33	.50	.617
Q27 Mean				
BT-AT	16.0	45.0	7.16	.000

### Mode of action of pranayama and breathing exercises

The breath is the most important sign of energy in the body. In order to get the control over the energy, initially one has to regulate the breathing. Breathing is regulated by the expansion and contraction of lungs.

The lungs can be expanded in 2 ways

1. By downward and upward movement of diaphragm, and
2. By elevation and depression of the ribs.

Contraction is taking place by elastic recoil of the respiratory muscles. The pneumotaxic center located in the superior portion of the midbrain controls the rate and pattern of breathing. A dorsal respiratory group in the medulla is causing the inspiration and a ventral respiratory group of neurons is controlling expiration, but the overall level of respiratory center activity is controlled to match the ventilatory needs of the body. This is achieved by two different ways- 1) By feedback excitation of respiratory center activity, in response to changes in chemical composition of the blood, especially its concentration of carbon dioxide, hydrogen ions, and oxygen. 2) By excitatory signals from other parts of the nervous system. The chemical composition of the blood depends on the metabolic activity of the body. The entire energy requirement is met through the metabolic activity of the body. The energy is being spent to perform all the physical and mental functions. Thus a breathing function is a link in the chain activities of body physiology. Hence, when one tries to regulate

breathing, he actually controls the muscle functions. Prana is the force behind all these functions. Hence the breathing regulations can control the prana. Like that the rhythmic activity of the prana regulates entire physiology of the body. Inturn the mind also gets controlled.

Regular pranayama helps to slow down the rate and regulate the pattern of breathing. Due to consequent reduction in the metabolic rate body requires only a small amount of oxygen and food. Reduced lung function gives more relaxation to the brain activities. Mind becomes quite and calm.

### DISCUSSION

Corona virus disease-2019 is caused by SARS-CoV-2, a newly emergent corona virus, which was first recognized in Wuhan, China, in December 2019. Genetic sequencing of the virus suggests that it is a beta coronavirus closely linked to SARS virus. The dynamics of SARS-CoV-2 are currently unknown, but it is speculated that it has animal origin.

Transmission of SARS-CoV-2 can occur through direct, indirect or close contact with infected people through secretions such as saliva and respiratory secretions or droplets which are expelled when infected person coughs, sneezes or talks. Clinical presentations were fever, cough, fatigue, anorexia, shortness of breath, myalgias. Other non-specific symptoms, such as sore throat, nasal congestion, headache, diarrhoea, nausea and vomiting have also been reported. In the containment phase, to break the chain of transmission of COVID-19, patients with suspected

or confirmed disease are isolated and treated at different levels.

*Pranayama* strengthens the respiratory musculature due to which chest and lungs inflate and deflate to fullest possible extent and muscles are made to work to maximal extent. *Pranayama* like *Naadishuddhi*, *Bhramari*, *Bhastrika* and *Kapaalabhaati* helps in bringing the sympathetic and parasympathetic nervous system into harmony. Through breathing we can influence the nervous system. *Pranayama* allows bronchial dilatation by correcting abnormal breathing pattern and reducing muscle tone of respiratory muscles.

Good breathing habits harness the energies for systematic development of the body and mind. The respiratory system is a bridge between the conscious and subconscious, or the body and mind. Breathing exercise helps in increasing the air build up in the lungs and diaphragm. It increases the lung capacity which gives more breathing space.

## CONCLUSION

Covid -19 impacts the lung health and can make even the simple act of breathing a struggle. 60 subjects of either sex between the age group 20-50 years, who were tested Covid positive and recovered and who approached SDM Ayurvedic Hospital were subjected to *Pranayama* and Breathing exercises for 60 days. When the data obtained before trials is compared to data obtained after trials, Subjects of group A showed statistically highly significant improvement in both objective as well as subjective parameters.

Many people complain of breathlessness, decreased ability to exercise, discomfort in breathing even after recovery from Covid-19. With improper breathing, body functions get affected and we are unable to release the stress and anxiety the way we used to do before, which ultimately affects our quality of life also. *Pranayama* is known to improve multiple aspects of physical health, including lung function,

blood-oxygen saturation, brain function and also quality of life. It also increases self-awareness, and happiness within, and also makes one feel relaxed and rejuvenated. *Pranayama* enables mastery over the mind. Thus, *Pranayama* has the potential to bring about physical, mental, emotional, and spiritual well-being in the practitioners. Brain, cardiac and respiratory functions are coupled strongly through the autonomic nervous system and manipulation of breath could change the activity in these organs. *Pranayama* and breathing exercises enhance energy levels and quality of life.

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