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A Study on Pulmonary Function Test in Post Covid-19 Patients with and Without Ct Chest Changes in GVMCH

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Abstract
Background: *The COVID-19 pandemic caused by the highly infectious SARS-CoV-2 has affected over 15.9 million people across 200 countries and caused more than 643,000 deaths. Severe acute respiratorysyndrome coronavirus 2 (SARS-CoV-2), causing COVID-19 disease, primarily affects the lungs. The clinical manifestations range from asymptomatic carriage to atypical pneumonia and acute respiratory distress syndrome (ARDS).*
Objectives: *To compare the pulmonary function test in COVID-19 survivors with and without CT chest changes. To study the residual effect of Covid-19 infection on pulmonary function of patients.*
Materials and methods:*This study was conducted in outpatient basis at Government Vellore Medical College and Hospital, Vellore. It is a hospital based prospective observational study. About 50 people were included in the study after meeting inclusion and exclusion criteria on the basis of random sampling method. The study period was from January 2021 to December 2021. The data for the purpose of the study was collected in a predesigned and pretested profoma.*
Results: *In the present study majority of the study participants were in the age group of more than 60 years (56%).About 24% were in the age group of 41 to 60 years. About 76% were males and 24% were females. In the present study 50% were obese,30% were overweight and 16% were in normal BMI . Mean BMI is 25.37 and standard deviation is 5.68. About 44% had Diabetes mellitus,56% had Hypertension,24% had Dyslipidemia and 16% had Cardiovascular disease. About 84% had fever,52% had cough,48% had arthralgia,64% had headache and 24% had GIT symptoms. Although pulmonary function parameters are better in patients without CT changes after 1 and 6 months of discharge there is statistically no significant association between both the groups (P>0.05) .But There is statistically significant association between both the groups with respect to TLC(P<0.05). There is statistically significant association in SPO2 after 6 min walk test after one and six month of discharge among study participants(P<0.05).*
Conclusion: *Lung is the most common organ affected in SARS-CoV-2 infection. For follow up in COVID-19 patients Pulmonary Function Test and 6-Minute walk test are the best tools to assess the pulmonary capacity. Based on our results it is concluded that there is statistically significant association between CT Chest changes during COVID illness and Pulmonary Function Test was done in 1month and 6 months after discharge. In addition to that we also found that 6 minute walking test also has association with CT Chest changes and severity and it is statistically significant. Hence all post-COVID patients should be followed up periodically to assess the symptoms and pulmonary function. With the results they should be treated with drugs and physiotherapy to improve their quality of life. More studies to be conducted in future to understand the short and long-term respiratory function sequelae of the COVID-19 to optimise the decision-making in clinical practice.*
Key words: *COVID-19, Pulmonary function test, CT Chest, 6 Minute walk test*

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I. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has presented a challenge to clinicians all over the world. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)causing COVID-19 disease, primarily affects the lungs. The clinical manifestations range from asymptomatic carriage to atypical pneumonia and acute respiratory distress syndrome (ARDS)[1].The coronavirus is a highly infectious virus and spreads through droplets generated during coughing, sneezing, talking, and even breathing. Indirect contact via contaminated surfaces is another possible cause of infection. The virus is inactivated by soap, which destabilizes its lipid bilayer[2].

Most patients requiring intensive care unit (ICU) admission, require invasive or non-invasive ventilatory support to maintain oxygenation.NIV may improve the long-term outcome in carefully selected

patients[3]. In certain cases, the use of HFNC and NIV may circumvent the need for intubation, reducing the hazards associated with intubation and invasive mechanical ventilation (MV), such as ventilator-associated pneumonia, lung injury, acute kidney injury, hemodynamic instability, etc. This is especially important in COVID-19 treatment since patients are administered immunosuppressive therapy (e.g., steroid) as part of the standard treatment regime[4]. Nonetheless, with the use of NIV for COVID-19 ARDS, a failure rate of 40-50% may be expected[5]. The patients who fail an NIV trial frequently require mechanical ventilation (MV).

Literature suggests that the rate of MV among COVID patients ranges from 29.1% to 89.9%[6]. After ICU discharge, a significant percentage of patients have been found to suffer from muscle fatigue as well as physical, mental, and cognitive complications[7]. Fifty percent of all patients, irrespective of age, who require MV develop post-intensive care syndrome[8]. The pathology of the lung in COVID-19 patients includes diffused alveolar damage[9], bronchiolitis, alveolitis and interstitial fibrosis[10]. Thus, patients who are infected with SARS-CoV2 may have a restrictive or obstructive defect on a spirometry during recovery. Previous studies[11,12] in Severe Acute Respiratory Syndrome (SARS) showed that patients had an abnormal pulmonary function test up to 20% after recovery from SARS.

PFT is a valuable tool in the assessment of a respiratory disease. Spirometry is the key diagnostic test for airway diseases such as asthma and chronic obstructive pulmonary disease (COPD), and is the most commonly performed test.Decisions regarding the conduct of PFTs need to balance the potential risks against the benefits from the test in making decisions. Several professional societies have advised to defer PFT still after the COVID-19 pandemic[13-16].

II. Materials and Methods

This Hospital based prospective observational study was carried out on patients of Department of General Medicine at Government Vellore Medical College, Vellore from January 2021- December 2021. The sample size was 50 patients and the sampling technique was Randomly Sampling Method. Approval from institutional ethical committee was obtained before starting the study. Informed consent was obtained from all patients before enrolling them for the study.

Inclusion criteria:

1.Covid-19 patients (confirmed by RT-PCR)
2.People in the age group of more than 20years
3.Patients who are willing to voluntarily participate in this study after informed consent

Exclusion criteria:

1.Patients with reactive airway diseases
2.Patients with pleural diseases
3.Patients with pulmonary tuberculosis both active and treated
4.Patients with neuro muscular disorders
5.Patients with respiratory infection
6.Patients with lung malignancy
7.Known Obstructive sleep apnoea syndrome
8.Smokers who are on regular treatment for chronic bronchitis
9.Patient with occupational hazard with respiratory system

Procedure methodology:

After prior Institutional ethical clearance and obtaining informed consent, the participants satisfying inclusion criteria will be selected for study. Each of the participants will be asked pre-specified questions according to the Proforma, in English and Tamil Patients chosen from covid19 follow-up opd and following investigations were done

1.Complete blood count, Random blood sugar, Serum urea, Serum creatinine, Liver function tests , ESR, CRP, d-Dimer, serum ferritin
2.Spirometry
3.CT-chest (optional for patients who are symptomatic on review)

Statistical analysis:

Data will be entered in MS-Excel. Percentage of the prevalence will be calculated and categorical data compared with chi square test. Data analysis will be done using SPSS-20.0 version. p value less than 0.05 will be considered significant. The analysis of data was made on the basis of the important statistical parameters like the mean deviation, standard error, the t-test and the proportion test.

III. Observations And Results

Table 1: Agewise distribution of study participants

Age in years	Frequency	Percentage	Mean ±S.D
0-20 years	3	6	
21-40 years	7	14	
41-60 years	12	24	61.16±2.56
>60 years	28	56	
Total	50	100	

In the present study majority of the study participants were in the age group of more than 60 years .(56%).About 24% were in the age group of 41 to 60 years. About 14% were in the age group of 21 to 40 years .Only 6% were in the age group of less than 20 years. Mean age is 61.16 and standard deviation is 2.56

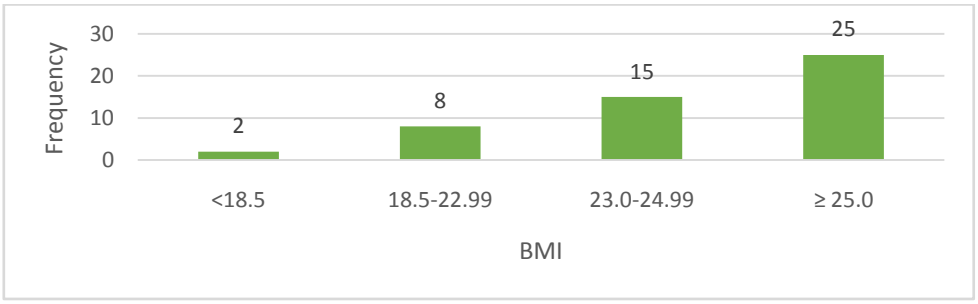
Table 2: Sex wise distribution of study participants

Sex	Frequency	Percentage
Male	38	76
Female	12	24
Total	50	100

This table shows about 76% were males and 24% were females among study group

Table 3:Body mass index among study participants

BMI	Frequency	Percentage	Mean ±S.D
<18.5	2	4	
18.5-22.99	8	16	
23.0-24.99	15	30	25.37±5.68
≥ 25.0	25	50	
Total	50	100	



In the present study 50% were obese,30% were overweight and 16% were in normal BMI .Mean BMI is 25.37 and standard deviation is 5.68

Table 4: Comorbidities among study participants

Comorbidities	Frequency	Percentage
Diabetes mellitus	22	44
Hypertension	28	56
Dyslipidemia	12	24
Cardiovascular disease	8	16

About 44% had Diabetes mellitus,56% had Hypertension,24% had Dyslipidemia and 16% had Cardiovascular disease

Table 5: Symptom wise distribution of study participants

Clinical features	Frequency	Percentage
Fever	42	84
Cough	26	52
Arthralgia	24	48
Headache	32	64
GIT symptoms	12	24

About 84% had fever,52% had cough,48% had arthralgia,64% had headache and 24% had GIT symptoms.

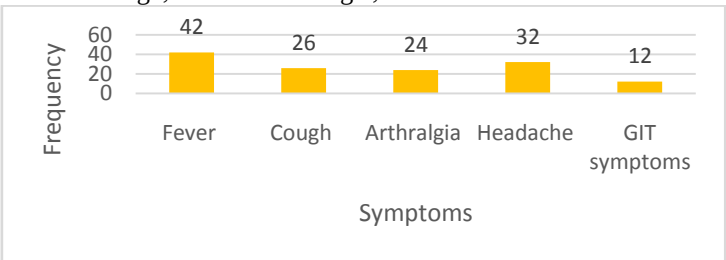


Table 6:Pulmonary function test among severe and non severe cases of study participants after 1 month of discharge

	Covid positive with CT changes		Covid positive without CT changes		P
Parameters	Mean	SD	Mean	SD	
FVC (% of predicted)	94.82	18.26	102.10	12.73	0.12
FEV1 (% of predicted)	92.73	12.86	98.76	14.76	0.26
FEV1/FVC(%)	79.58	4.76	80.47	5.63	0.31
TLC (% of predicted)	87.52	15.20	95.22	8.75	0.03
RV (% of predicted)	85.47	13.96	91.37	19.82	0.76

Although pulmonary function parameters are better in patients without CT changes after one month of discharge there is statistically no significant association between both the groups (P>0.05).There is statistically significant association between both the groups with respect to TLC(P<0.05)

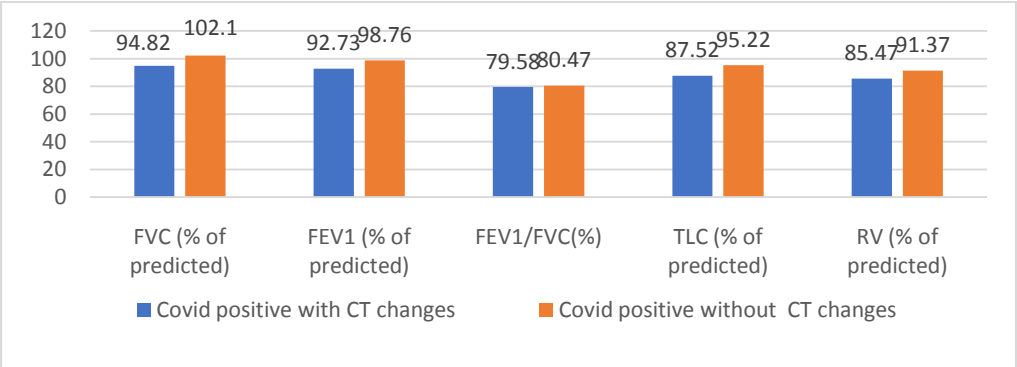


Table 7:Pulmonary function test among severe and non severe cases of study participants after 6 months of discharge

	Covid positive with CT changes		Covid positive without CT changes		P
Parameters	Mean	SD	Mean	SD	
FVC (% of predicted)	98.82	18.26	101.10	12.73	0.12
FEV1 (% of predicted)	99.73	12.86	99.76	14.76	0.26
FEV1/FVC(%)	88.58	4.76	89.47	5.63	0.31
TLC (% of predicted)	93.52	15.20	95.72	8.75	0.03
RV (% of predicted)	95.47	13.96	98.37	19.82	0.76

Although pulmonary function parameters are better in patients without CT changes after 6 months of discharge there is statistically no significant association between both the groups (P>0.05) .There is statistically significant association between both the groups with respect to TLC(P<0.05)

Table 8:Association between CT changes and pulmonary function test among study participants after 6 months of discharge

	Covid with CT changes N=25	Covid without CT changesN=25	P value
Parameters			
FVC			
Normal	7	19	0.0001
Abnormal	18	6	
FEV1			
Normal	9	23	0.0001
Abnormal	16	2	
FEV1/FVC(%)			
Normal	7	21	0.03
Abnormal	18	4	
TLC			
Normal	6	20	0.009
Abnormal	19	5	

There is statistically significant association between CT changes and pulmonary function test among both the groups of study participants after 6 months of discharge(P<0.05)

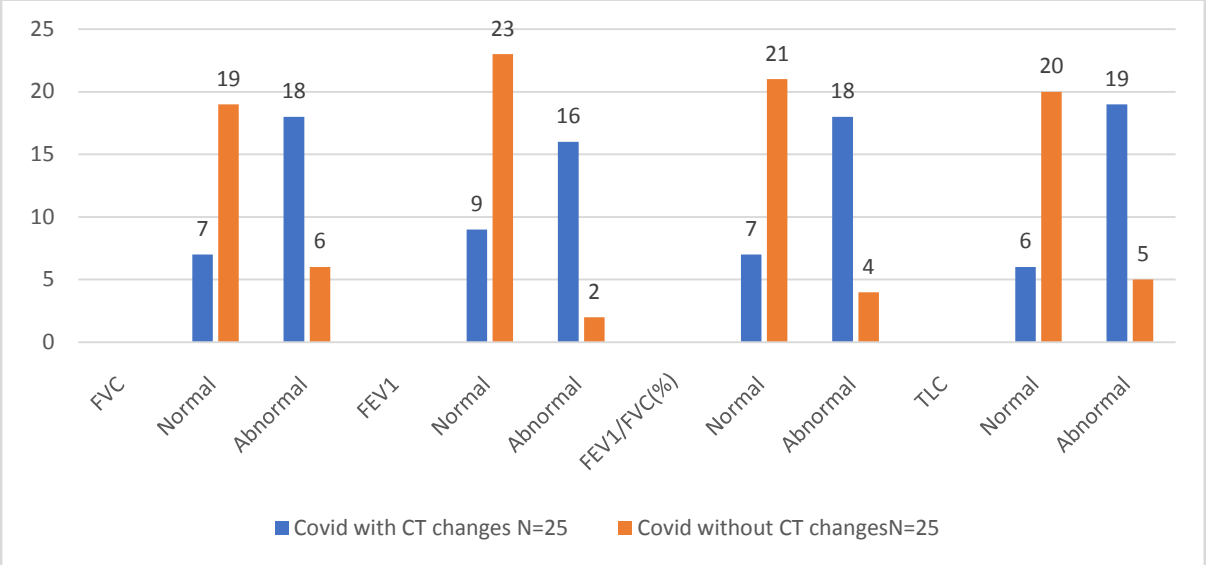


Table 9:SPO2 after 6 min walk test after one month of discharge among study participants

Group	SPO2	SD	T test	P value
Covid with CT changes N=25	89	2.86	8.93	0.0001
Covid without CT changesN=25	94	5.67		

There is statistically significant association in SPO2 after 6 min walk test after one month of discharge among study participants(P<0.05)

Table 10:SPO2 after 6 min walk test after 6 months of discharge among study participants

Group	SPO2	SD	T test	P value
Covid with CT changes N=25	92	1.17	4.93	0.001
Covid without CT changesN=25	98	3.67		

There is statistically significant association in SPO2 after 6 min walk test after 6 months of discharge among study participants(P<0.05)

IV. Discussion

In the present study majority of the study participants were in the age group of more than 60 years .(56%).About 24% were in the age group of 41 to 60 years. About 14% were in the age group of 21 to 40 years .Only 6% were in the age group of less than 20 years. Mean age is 61.16 and standard deviation is 2.56. About 76% were males and 24% were females .In the present study 50% were obese,30% were overweight and 16% were in normal BMI .Mean BMI is 25.37 and standard deviation is 5.68.About 60% were smokers and 24% were alcoholics. About 44% had Diabetes mellitus,56% had Hypertension,24% had Dyslipidemia and 16% had Cardiovascular disease. About 84% had fever,52% had cough,48% had arthralgia,64% had headache and 24% had GIT symptoms.

Although pulmonary function parameters are better in patients without CT changes after one month of discharge there is statistically no significant association between both the groups (P>0.05).There is statistically significant association between both the groups with respect to TLC(P<0.05). Although pulmonary function parameters are better in patients without CT changes after 6 months of discharge there is statistically no significant association between both the groups (P>0.05) .There is statistically significant association between both the groups with respect to TLC(P<0.05). There is statistically significant association between CT changes and pulmonary function test among both the groups of study participants after 6 months of discharge(P<0.05)

There is statistically significant association in mean distance walked by 6 min walk test among study participants after one month of discharge(P<0.05).There is statistically significant association in mean distance walked by 6 min walk test among study participants after 6 months of discharge(P<0.05).There is statistically significant association in SPO2 after 6 min walk test after one month of discharge among study participants(P<0.05).

V. Conclusion

Lung is the most common organ affected in SARS-CoV-2 infection. For follow up in COVID-19 patients Pulmonary Function Test and 6-Minute walk test are the best tools to assess the pulmonary capacity.

Based on our results it is concluded that there is statistically significant association between CT Chest changes during COVID illness and Pulmonary Function Test was done in 1month and 6 months after discharge. In addition to that we also found that 6 minute walking test also has association with CT Chest changes and severity and it is statistically significant.

Hence all post-COVID patients should be followed up periodically to assess the symptoms and pulmonary function. With the results they should be treated with drugs and physiotherapy to improve their quality of life.

More studies to be conducted in future to understand the short and long-term respiratory function sequelae of the COVID-19 to optimise the decision-making in clinical practice.

References

[1]. Grasselli G, Zangrillo A, Zanella A, et al.: Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy Region, Italy. JAMA. 2020, 323:1574-81.

[2]. Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS CoV 2 as compared with SARS CoV 1. N Engl J Med 2020;382:1564 7.

[3]. Vitacca M, Clini E, Rubini F, Nava S, Foglio K, Ambrosino N: Non-invasive mechanical ventilation in severe chronic obstructive lung disease and acute respiratory failure: short- and long-term prognosis. Intensive Care Med. 1996, 22:94-100. 10.1007/BF01720714

[4]. Storgaard LH, Hockey HU, Laursen BS, Weinreich UM: Long-term effects of oxygen-enriched high-flow nasal cannula treatment in COPD patients with chronic hypoxemic respiratory failure. Int J Chron Obstruct Pulmon Dis. 2018, 13:1195-205. 10.2147/COPD.S159666

[5]. Antonelli M, Conti G, Proietti R: Non-invasive ventilation in acute hypoxemic respiratory failure . Yearbook of Intensive Care and Emergency Medicine 2001. Vincent JL (ed): Springer, Berlin; 10.1007/978-3-642- 59467-0_44. 2001:522-9. 10.1007/978-3-642-59467-0_44

[6]. Wunsch H: Mechanical ventilation in COVID-19: interpreting the current epidemiology . Am J Respir Crit Care Med. 2020, 202:1-4. 10.1164/rccm.202004-1385ED

[7]. Nalbandian A, Sehgal K, Gupta A, et al.: Post-acute COVID-19 syndrome. Nat Med. 2021, 27:601-15. 10.1038/s41591-021-01283-z

[8]. Hopkins RO, Weaver LK, Collingridge D, Parkinson RB, Chan KJ, Orme JF Jr: Two-year cognitive, emotional, and quality-of-life outcomes in acute respiratory distress syndrome. Am J Respir Crit Care Med. 2005, 171:340-7. 10.1164/rccm.200406-763OC

[9]. Bradley BT, Maioli H, Johnston R, Chaudhry I, Fink SL, Xu H, et al. Histopathology and ultrastructural findings of fatal COVID-19 infections in Washington State: a case series. The Lancet 2020; 396 (10247): 320–332. https://doi.org/10.1016/S0140-6736(20)31305-2 PMID: 32682491

[10]. Yao XH, Li TY, He ZC, Ping YF, Liu HW, Yu SC, et al. A pathological report of three COVID-19 cases by minimally invasive autopsies. Zhonghua Bing Li Xue Za Zhi 2020; 49(5): 411–417. https://doi.org/10. 3760/cma.j.cn112151-20200312-00193 PMID: 32172546

[11]. Hui DS, Joynt GM, Wong KT, Gomersall CD, Li TS, Antonio G, et al. Impact of severe acute respiratory syndrome (SARS) on pulmonary function, functional capacity and quality of life in a cohort of survivors. Thorax 2005; 60(5): 401–409. https://doi.org/10.1136/thx.2004.030205 PMID: 15860716
[12]. Xie L, Liu Y, Xiao Y, Tian Q, Fan B, Zhao H, et al. Follow-up study on pulmonary function and lung radiographic changes in rehabilitating severe acute respiratory syndrome patients after discharge. Chest 2005; 127(6): 2119–2124. https://doi.org/10.1378/chest.127.6.2119 PMID: 15947329
[13]. Guideline on Lung Function Testing V2 30.03.pdf. Available from: https://irishthoracicsociety.com/wp content/uploads/2020/03/ Guideline on Lung Function Testing V2 30.03.pdf. [Last acessed on 2020 Jun 27].
[14]. ERS 9.1 Statement on Lung Function During COVID 19 Final with Contributors.pdf | Powered by Box. Available from: https://ers.app. box.com/s/zs1uu88wy51monr0ewd990itoz4tsn2h. [Last accessed on 2020 Jun 27].
[15]. Pulmonary Function Laboratories: Advice Regarding COVID 19. Available from: https://www.thoracic.org/professionals/clinical resources/ disease related resources/pulmonary function laboratories.php. [Last accessed on 2020 Jul 04].
[16]. Rasam SA, Apte KK, Salvi SS. Infection control in the pulmonary function test laboratory. Lung India 2015;32:359 66.

Dr.BALACHANDAR S, et. al. "A Study on Pulmonary Function Test in Post Covid-19 Patients with and Without Ct Chest Changes in GVMCH." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(11), 2022, pp. 54-60.