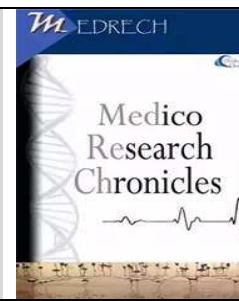




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### POST RECOVERY COVID-19 PATIENTS: FACTORS AFFECTING OXYGEN SATURATION AND COMPLICATIONS IN THEM

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#### ABSTRACT

Oxygen saturation is a measure of how much hemoglobin is currently bound to oxygen compared to how much remains unbound. Oral steroids rapidly reduce inflammation and are associated with the rapid rise in oxygen saturation. The post-recovery complications vary from Relapsing fever to wakefulness to tiredness. Proning has been found effective in increasing the oxygen saturation of the patient. The objectives of this study is to determine the effect of steroids, antifungals, proning, and breathing exercises on post-recovery oxygen saturation in COVID- 19 patients and to find the common post-recovery complaints/complications in the COVID-19 patients. It was a cross-sectional study. The study had 34 participants. All the participants had a history of COVID-19 infection. 31 reported post-recovery tiredness. 13 practiced proning in the recovery period while 12 practiced breathing exercises. The oxygen saturation was compared with those who took oral steroids by Pearson Chi-Square test the P-value was found to be 0.000 thus there is a significant difference between the oxygen saturation of those who received oral steroids and those who did not. There is a significant association between the use of antifungals and oxygen saturation post-recovery with Pearson Chi-square p-value 0.003. The Pearson Chi-Square test gives a p-value of 0.000 thus there is a significant association between post-recovery oxygen saturation and proning. The Pearson Chi-Square test gives a P-value of 0.003 thus there is a significant association between post-recovery oxygen saturation and breathing exercises.

#### ORIGINAL RESEARCH ARTICLE

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#### INTRODUCTION

Oxygen saturation is the fraction of saturated hemoglobin relative to total

hemoglobin (saturated + Unsaturated) in the blood. Oxygen saturation is a measure of how much hemoglobin is currently bound to

oxygen compared to how much hemoglobin remains unbound.<sup>[1]</sup> The normal arterial oxygen saturation in humans lies between 95-100%. It is a major determinant of the severity and progression of ongoing COVID-19 disease. The changes in oxygen saturation are said to be more marked in people with occupation-related lung disorders. The various co-morbidities such as obesity, hypertension, diabetes mellitus, asthma, etc. are all more prone to severe disease<sup>[2]</sup>. Regular monitoring of all these co-morbidities is needed in post covid recovery as they lead to complications later. COVID 19 infection alters the blood sugar levels of the body so strict monitoring once in three days and regular consultation is required.

India is home to various pathies<sup>[3]</sup> and some experienced practitioners have helped manage the patient load. The pathy used for the treatment has its effect on recovery and by extension on oxygen saturation. The use of steam and gargling is also said to be effective. As for the allopathic treatment oral steroids rapidly reduce inflammation and are associated with the rapid rise in oxygen saturation. Although steroids come with their own set of side effects, such as opportunistic infections. The fungal infections in the oral cavity are common post recovery and is said to be due to steroid use.

Since COVID-19 is a catabolic disease<sup>[4]</sup>, diet and minerals play a major role in the recovery of health. The calorie intake along with vitamin and mineral consumption is pivotal in recovery as the energy deficit can be a major obstruction in the body's ability to heal itself. The treatment modality leads the way towards lung involvement, and the days since recovery tell us the amount of residual infiltration/fibrosis to be expected.

HRCT score gives a pictorial view of the severity and is directly related to the fall in the oxygen saturation. D-Dimer values when more than twice the upper limit are prone to clotting disorders and thus pulmonary

complications, anticoagulant therapy is thus a must in such patients. The post-recovery complications vary from Relapsing fever, teeth ache, to jaw pain, to oral ulcers, and tiredness<sup>[5]</sup>. All of these are associated with protein-energy deficiency, vitamin deficiency, steroid or oxygen use.

Relapsing fever could indicate residual infection, inflammation, or superinfection all of which are poor prognostic factors. All of these are said to reduce the oxygen saturation and hinder the recovery of the patient. This reduced oxygen saturation causes reduced oxygen saturation at night causing myoclonic jerk and interrupted sleep. On the contrary, Proning has been found effective in increasing the oxygen saturation of the patient significantly. Along with breathing exercises, hydration has proved to be beneficial in increasing the oxygen saturation

#### **OBJECTIVES**

- To determine the effect of steroids, antifungals, proning, and breathing exercises on post-recovery oxygen saturation in COVID- 19 patients.
- To find the common post-recovery complaints/complications in the COVID-19 patients.

#### **METHODOLOGY**

It was a cross-sectional study conducted in the casualty of ACPM Medical College & Hospital, Dhule. The inclusion criterion was the patients who have recovered from COVID-19 who were not suffering from any other disease. Those who were unwilling to participate or non-cooperative were excluded. The duration of the research was 55 days from 6<sup>th</sup> May 2021 to 29<sup>th</sup> June 2021. The study had 34 participants, mean, standard deviation, prevalence, and Pearson Chi-Square test was applied to the data collected. Microsoft Excel and SPSS v16.0 were used for this purpose. The research was approved by the institutional ethical committee prior to the study.

## RESULT

The study was conducted amongst the 34 patients who came to the casualty of ACPM Medical College and Hospital. The mean age of the sample was 44.08 (14.51), with 21 males and 13 females. All the participants had a history of COVID-19 infection. The mean BMI of the sample was 24.32 (3.12) while the oxygen saturation was 95.79 (2.02). Among the participants, 26.47% had diagnosed diabetes, and 8.82% suffered from Asthma. 15 were on a strict vegetarian diet while the remaining 19 had a mixed diet. The mean weekly intake of green leafy vegetables was 4.117 (1.591) times while fruits were eaten 4 (2) times at an average. 16 of the participants were treated at home while 18 had hospital admission, of these 2 had ICU admission. The majority of the patients preferred allopathy with 32 taking allopathic treatment while only 2 relied solely on other pathies. While all 34 patients had taken

vitamins only 7 needed gaseous oxygen for the treatment, 17 patients also took steroids. 18 patients were put on anticoagulants and 15 received antifungal treatment. Steam inhalation and gargling were regularly practiced by 32 and 27 participants. 10 patients developed oral ulcers post-recovery while, 9 developed teeth ache, 11 complained of jaw pain. 31 reported post-recovery tiredness. 4 came back with relapsing fever. 23 complained of wakefulness at night or interrupted sleep. 13 practiced proning in the recovery period while, 12 practiced breathing exercises in the form of yoga, meditation or pranayama. 8 patients reported a weight loss of more than 5% while 5 reported less than 5% weight loss, others had no significant change in weight. The correlation coefficient between the BMI and Oxygen Saturation was found to be -0.02 since the value is less than 0.30 thus the correlation is negligible.

**Table-1: Oxygen Saturation and Oral Steroids**

		steroid		Total
		a	b	
OS	b	15	5	20
	c	2	12	14
Total		17	17	34

In the collected data, the oxygen saturation was divided into 2 sections of those who had an oxygen saturation of 96 and those with 97 and above this data was compared with those who took oral steroids. Based on Pearson Chi-

Square test Asymp. Sig. (2 sided) the P-value was found to be 0.000 ( $p < 0.05$ ) thus there is a significant difference between the oxygen saturation of those who received oral steroids and those who did not.

**Table-2: Oxygen Saturation and antifungals**

		antifungal		Total
		a	b	
OS	b	13	7	20
	c	2	12	14
Total		15	19	34

The Pearson Chi-Square test gives a p-value of 0.003 ( $p < 0.05$ ) thus there is a significant

association between the use of antifungal and oxygen saturation post-recovery.

		Proning		Total
		a	b	
OS	b	2	18	20
	c	11	3	14
Total		13	21	34

The Pearson Chi-Square test gives a p-value of 0.000 ( $p < 0.05$ ) thus there is a significant

association between post-recovery oxygen saturation and proning.

		breathingexe		Total
		a	b	
OS	b	3	17	20
	c	9	5	14
Total		12	22	34

The Pearson Chi-Square test gives a P-value of 0.003 ( $p < 0.05$ ) thus there is a significant

association between post-recovery oxygen saturation and breathing exercises.

		antifungal		Total
		a	b	
steroid	a	14	3	17
	b	1	16	17
Total		15	19	34

The Pearson Chi-Square test gives a p-value of 0.000 ( $p < 0.05$ ) thus there is a significant association between those who received antifungal treatment and those who took oral steroids

## DISCUSSION

Various studies have shown the effect of position on the blood pressure of the person. A study by Simin Jahani *et. Al.* gave results of systolic pressure in prone position to be 123.33 (7.4) mmHg, while in supine it was 122.77 (12.19) mmHg<sup>[6]</sup>, another study by Narges Meftahi *et. Al.* said that prone systolic pressure was 116.4 (14.5) mmHg while in

supine it was 111.3 (13.4) mmHg<sup>[7]</sup>, in our study we found systolic blood pressure in prone position to be 128.8 (10.8) mmHg while in supine it was 132.2 (10.59) mmHg. A similar effect was found on diastolic pressure. The study by Simin Jahani *et. Al.* showed diastolic pressure in prone position to be 55 (3.9) mmHg while in the supine position it was 97 (3.3) mmHg<sup>[6]</sup>, Narges Meftahi *et. Al.* reported prone diastolic pressure to be 77.6 (10.4) mmHg while in supine it was 78.2 (9.3) mmHg<sup>[7]</sup>. Our study showed prone diastolic pressure to be 83.05 (5.6) mmHg while in supine it was 81.47(6.23) mmHg.

Our study found that there is an effect of rising temperature on oxygen saturation. We found that the SpO<sub>2</sub> rose by 0.5% when the temperature rose by 3°F. The study by Dikla Zigdan Lahav *et al.* reported a rise of 2% in SpO<sub>2</sub> with an increase of 2.3°C temperature<sup>[8]</sup>. Shumule Goldberg showed a rise in SpO<sub>2</sub> of 1-1.5% with a rise in temperature of 2°C<sup>[9]</sup>.

Jerrold S. Petrofsky *et al.* reported a decrease in SpO<sub>2</sub> with an increase in BMI<sup>[10]</sup>, our study confirmed the decrease in SpO<sub>2</sub> with an increase in BMI, with a correlation coefficient of -0.02.

Alizer Abidi *et al.* showed that the prevalence of diabetes in COVID patients was 14.5%, our study showed that it is 26.47%.<sup>[11]</sup>

Aditya Moorthy, Rohith Gaikwad *et al.* showed that out of 15 patients that received oral steroids 12 (80%) developed a fungal infection and needed antifungal treatment.<sup>[12]</sup> Our study showed that out of 17 patients who received oral steroids 14(82.35%) developed a fungal infection and received antifungal treatment. We also confirmed that there is a significant association between the two with Pearson Chi-Square test which showed a p-value of 0.000 (p=0.05).

Dorthea Closhen showed that there is a 5% increase in SpO<sub>2</sub> in those who practiced proning<sup>[13]</sup>. Our study showed a 2.02% increase in SpO<sub>2</sub> in those who practice proning.

#### CONCLUSION

1. There is a significant association between the oxygen saturation post recovery and oral steroid use during treatment
2. There is a significant association between antifungal use and oxygen saturation post-recovery
3. There is a significant association between oxygen saturation post recovery and proning practices
4. There is a significant association between post-recovery oxygen saturation and breathing exercises

5. There is a significant association between steroid use and antifungal use later on.
6. In those who recovered from COVID-19, a little a quarter was diabetic while almost one-tenth were asthmatic.
7. The most common post-recovery complication was reported to be fatigability
8. The correlation of BMI with oxygen saturation is negligible.
9. Steam inhalation and gargling is practiced in the post-recovery period by the majority of participants
10. Wakefulness at night and interrupted sleep were also reported frequently.

#### RECOMMENDATION

1. Pranayam, yoga, Meditation, and other breathing exercises are useful in increasing Oxygen saturation post-recovery
2. Proning should be regularly practiced for better oxygen saturation post-recovery.
3. Oral steroids during treatment are good alternative and positively and effectively increase oxygen saturation post-recovery.
4. Antifungals should be given to those who received steroid treatment
5. Fatigability is common post-recovery, so rest and proper nutrition are essential.

**CONFLICT OF INTEREST-** None

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