



Clinical Profile and Physiotherapy Intervention in COVID-19 Patients: An Observational Study

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Abstract-

Aim- Covid 19 spike during Phase-II brought more organized multidisciplinary health care based on evidence. Chest physiotherapy, including proning, was recommended for desaturating patients in ICU. However, all patients did not tolerate changes in positions and proning. This study aimed at clinical profiling of patients as well as the development of a physiotherapy plan of care based on the needs of patients at different levels.

Material and methods- Clinical profile of patients diagnosed with SARS-COV-2 during two months when there was peak in second wave were analysed. Patients' status and physiotherapy treatment mode and safety of positioning and physiotherapy was established.

Results- There were 99 patients referred for physiotherapy from COVID ICU during the period of study. Patients had different co-morbidities and reasons for desaturation which cannot be concluded. However, a plan of physiotherapy care was developed in the study which is the first of its kind.

Conclusion- The laid protocol of care based upon understanding the needs of these patients, logical classification as per their status, way to improve postural desaturation and prioritize the need of care in terms of bronchial hygiene, work of breathing, or improving compliance was a novel and helpful approach.

Key-words: COVID-19, ICU, Physiotherapy care, Chest physiotherapy, Clinical profiling

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Introduction

The rapid exponential diffusion of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has dramatically shaken the functional organization (1) of public and private health facilities in India. The Kasturba Medical College Hospital, Ambedkar circle took care of many patients per day, who were acutely ill and required intensive care either by mechanical ventilation or non-invasive ventilation apart from other positive patients who were isolated in different areas due to other illnesses along

Patients with COVID-19 can develop pneumonia characterized by bilateral interstitial infiltrates with severe hypoxic respiratory insufficiency following a serious alteration of the ventilation-perfusion ratio. Patients with the acute hypoxemic state may also experience persistent dyspnoea despite the administration of high oxygen flows. In these cases, other devices such as invasive and non-invasive ventilation may be useful. This first phase led patients to a

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complicated the post-infectious recovery. (3) After 1 month of admissions our hospital devised multidisciplinary care, emerged in the leadership of intensivists and primary physicians. A specialized rehabilitation team including physiotherapy was thus greatly needed in COVID ICU.

Despite having benefits of the chest and respiratory physiotherapy known, there is still a lot of uncertainty about interventions to be used depending upon the level of the severity and clinical picture of the patient. Therefore, clinical profiling of patients was the first objective. Second, all hospitals are not super-specialized and having a state of art care known to physiotherapists. There is a sudden shift in paradigm and the medical team is looking at physiotherapy to be a stakeholder in the management of the patients with COVID. This study will give that formulated physiotherapy intervention protocol for ICU admitted, based on already treated patients in the month of May-June 2021. Different patients

are at different levels. Some patients cannot tolerate even postural changes and proning. This postural intolerance and desaturation maybe linked with the patient clinical profile.

Material and Methods

The study was conducted at Kasturba Medical College Hospital, Ambedkar Circle, Mangalore. Institutional ethics committee approval was taken. Consecutive adult patients (>18 yr.) who tested positive on real-time reverse transcriptase-polymerase chain reaction (RT-PCR) assay for SARS-CoV-2 on a throat and/or a nasopharyngeal swab were admitted to COVID ICU due to desaturation and/or disease severity were included in the study. The primary reason for admission to ICU was desaturation and disease severity of severe and critically ill level as mentioned in a previous study(4). For clinical profiling of patients, data were collected from medical files. The clinical profile of patients is given in Table 1.

Variables	Mean \pm Std. deviation	Range	
Age (in years)	58.16 \pm 7.308	36-73	
Hb	12.764 \pm 1.6380	9.0-16.8	
Platelet Count (in lakhs)	249000 \pm 76213	113000-583000	
WBC ($\times 10^9$ /Lit.)	6.9	6.1 - 9.7	
DLC			
Neutrophils (%)	53	45-68	
Lymphocytes (%)	27	21-33	
Creatine (in mg/dL)	1.1414 \pm .30871	0.39-1.90	
Urea (in mg/dL)	22.422 \pm 7.7093	10-69	
Sodium (in mEq/L)	137.18 \pm 4.197	116-145	
Potassium (in mmol/L)	4.0030 \pm .45391	2.54-5.72	
D-Dimer*	0.89	0.52- 1.8	
CRP (mg/dl)	1.4	0.12 - 249	
Ferritin (ng/ml)	235	7.92 -1576	
Variables	Categories	Count	Percentage
Gender	Male	87	87
	Female	12	12

Comorbidities	None	12	12.8
	HTN	15	16.0
	DM	10	10.6
	HTN+DM	38	40.4
	HTN+DM+idiopathic thrombocytopenia	2	1.1
	HTM+COPD		
	DM+IHD	2	2.1
	DM+BA	1	1.1
	IHD+MI	1	1.1
	HTM+DM+IHD	2	2.1
	HTN+Hypothyroidism	2	2.1
	MI+Cardiac Arrest	1	1.1
	IHD+DM	1	1.1
	HTN+DM+hyponatremia	3	3.2
	HTN+IHD+MI	2	2.1
	HTN+DM+IHD+Hypothyroidism	2	1.1
DM+Pulmonary TB	2	1.1	
	2	1.1	
Percent oxygen saturation room air, n (%)			
	<94	91	
	≥94	8	
Respiratory rate (breaths/min), n (%)			
	<24	3	
	≥24	96	
HR (beats per minute)			
	<100	12	
	≥100	87	
BP (mmHg)		Median	Range
SBP (mmHg)		132	122-206
DBP (mmHg)		78	60 - 100
Oxygen supplementation (n=99)	Number	Percentage %	
MV and intubated	25	25%	
Non-rebreathing mask	55	55%	
AIR VO2	05	05%	
Low flow	14	14%	

* Normalised D-Dimer value (1 indicates 240 ng/ml)

Table 1: Clinical profile of patients

Patients' severity has been reported in previously reported studies based on symptoms and pneumonia(4,5). But, physiotherapy challenges were different. Studies all over the world recommended prone positioning but postural desaturation was not allowing patients to change their positions(6). There was huge desaturation from supine to prone and lying to sitting in some patients. Therefore, we devised a ladder of positions as shown in **fig. 2**, where the physiotherapist had to first determine the most convenient position, where the patient was maintaining the best possible saturation. From that position, patients were taken to a higher position and their acclimatization was gradually developed for that higher position. Similarly, when the patient achieved a higher position, the next higher position was tried for gradual adaptation and maintenance of saturation aiming to upright, stand, and then

walk. The whole process seems easy but this was most challenging for physiotherapy intervention to succeed. Therefore, For the sake of convenience of reporting patient status and physiotherapy treatment mode, we have classified the COVID-ICU patients into 8 categories as shown in **Fig.1**. Further, patients had primarily three kinds of problems which were amenable to physiotherapy intervention; secretions lodging, breathlessness and reduced compliance. To tackle these problems, possible physiotherapy interventions were listed to be applied over the patients as shown in Table. 2.



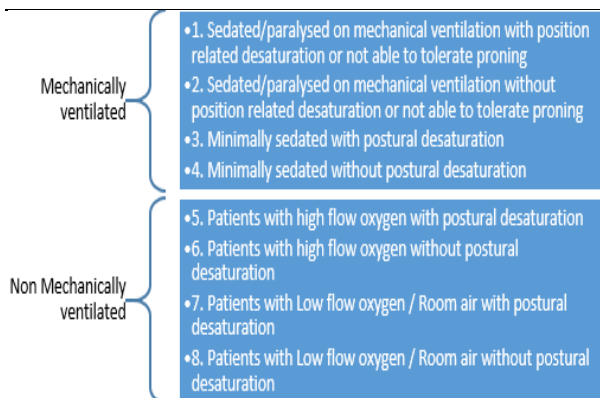


Fig.1: COVID-ICU patients divided in to 8 categories for the sake of convenience of reporting of patient status and physiotherapy treatment mode



Physiotherapy techniques for different indications

Techniques to increase lung volume	To decrease Work of Breathing (WoB)	To clear secretions
1) Controlled mobilization 2) Positioning 3) Breathing exercise (a) diaphragmatic breathing (b) purse-lip breathing (c) incentive spirometer (d) end-inspiratory hold 4) Neurophysiologic facilitation 5) Rib springing	1) Positioning (a) side-lying with pillow supported (b) high sitting (c) long sitting with the knee flexed and leaning forward with pillow 2) Relaxation 3) Breathing re-education (a) abdominal breathing (b) Innocenti technique 4) Non rebreathing mask 5) Desensitization to dyspnoea (DD) 6) Breathing control training	1) Positioning 2) Postural drainage (as per lobe involvement) 3) Chest manipulative techniques (a) percussion (b) vibration (c) shaking 4) Suctioning (a) Endotracheal (b) oral (c) nasal 5) Huffing and coughing 6) Breathing techniques (a) active cycle of breathing technique (ACBT), (b) autogenic drainage (AD) 7) Positive expiratory pressure (PEP) devices (a) Flutter (b) acapella

Table 2: Physiotherapy techniques for different indications

<p>Example- Category 1: Patient 1 - Sedated/paralyzed on mechanical ventilation with position related desaturation or not able to tolerate proning</p> <p>Steps and techniques adopted: Increase FiO₂ Pre suction positioning (to facilitate movement of secretions up on chest physiotherapy) Humidification and nebulization if secretions are dry Percussion / vibration /shaking Instill saline or saline with bicarbonate for mucolysis ET suction and/or pharyngeal and/or oropharyngeal Quarter proning - observe for maintenance of saturation If base position is tolerated well, as a mean of progression, different positions tried aiming at long sitting and edge of bed to mobilize out of bed Position possibly prone or near to prone to maintain saturation at minimal FiO₂</p>
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Table 3: shows Example of treatment modalities for one patient of category 1 as given in figure 1 and treatment modalities chosen from table 1

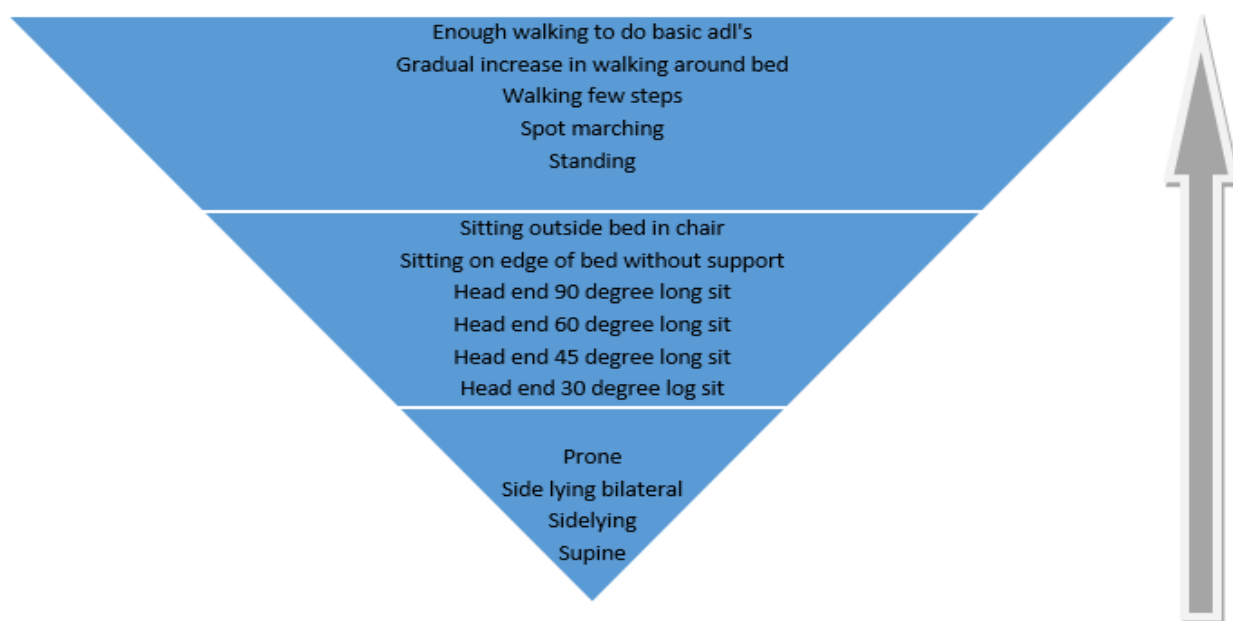


Fig. 2: Steps of positioning and mobilization to reduce postural desaturation (Patients' current status is to be established and has to improve upper in the ladder fashion)



RESULTS

The clinical profile of 99 patients admitted from May to June is given in table 1. The majority were males and the mean age of patients was 57. Blood chemistry profiles of inflammatory markers, vitals, and comorbidities are also given in table 1. Patients' primary problems were desaturation for which they were admitted to ICU. Their ventilation-oxygenation demand was met with low flow oxygen therapy through a face mask or nasal prongs, if patients did not improve then high flow venturi, AR VO₂, and/or CPAP/BiPAP was tried. The last resort was intubation and mechanical ventilation.

Challenges posed to physiotherapy were to take patients toward higher positioning close to independence like upright independent sitting, standing, and walking. This was related to the ventilation-oxygenation status of the patients. For the ease of intervention and positioning, patients were classified into eight categories as shown in Fig1. For postural desaturation, Therapists determined wherein the positioning chart the patient falls and from there progression was made to a higher level as listed in fig. 2. Techniques listed in table 2 were used to achieve bronchial hygiene, reduction in breathlessness, and improve lung volumes.

The progression shown in Fig. 2 depicts increasing levels of function and stability. If the patient was unable to attend next posture, then the patient was gradually improved from a tolerated position to a non-tolerable position. For example: if the patient did not tolerate prone position, then side lying was adopted and tried, saturation once gradually improved after many trials, the patient was slowly progressed to prone position. One such example of a patient is shown in table 3. The progression was used as a guideline and all patients need not strictly progress to a higher level in the same way. A patient might achieve a higher level skipping an intermediate level.

DISCUSSION

COVID 19 has been the trending term among all sections of people without any borders, it has been a term synonymous in the mind of people as a threat, panic, end of life, survival of

fittest, new avenues, life-changing, and for the medical fraternity as old wine in new bottle repeating it after a century, a strong mutant to combat, helpless at a certain level yet as Gods to many lives. Physiotherapy practice during the first wave of COVID and thereafter had been a challenge and period of observation, learning, postulation, and suggestions to clinical physiotherapy. Many guidelines are appearing in the literature regarding physiotherapy care based on experience(3,7-9).

Treating oxygen-dependent Covid patients in the COVID ICU has given us a mixed state of care and meaning in clinical practice, making us redo our thought process on our approaches to the currently faced situation over the second wave spike of COVID at our hospital in India between the period of May-June-2021. Chest care has been a mainstay of physiotherapy in the COVID ICU with patients dependable on varying levels of oxygen support based on the saturation issues influenced by the degree of lung affected, comorbidities, anxiety, and most importantly the body position. Among the patients whom we have cared for in COVID ICU, we applied published guidelines in literature to formulate and organize physiotherapy care as per the needs of the patient to alleviate the distress of the patients through our care. Unlike the first wave of COVID management, during the second wave, we have evolved upon a working plan during this period by segregating patients depending on the level of oxygen dependency and delivering physiotherapy techniques appropriate to the requirement and ability. A total of 99 COVID patients in ICU were referred for physiotherapy over 56 days from May-June-2021, which was the peak of COVID second wave in Karnataka, India. The physiotherapy care was a collective team approach, the team consisted of a Physician, Intensivist, Physiotherapist, respiratory therapist, and nurses of the COVID ICU care team at Manipal Hospitals, KMC Mangalore.

The study aimed at disseminating the approach of physiotherapy care for COVID patients at ICU, to make the COVID care team/professionals aware of the physiotherapy care plan for such situations in



the future. The most challenging was postural desaturation. Although Prone was proved for its benefits(5,10), many patients were not able to tolerate it. Therefore, this study devised a ladder of positioning for the sake of practice. The patient was identified where it lies in the ladder as given in Fig. 2. And then progress up to a more challenging position for recovery. Wherever deemed appropriate therapist added exercise which can aid in moving to a higher possibility. For example, spot marching and quadriceps strengthening before progressing to walking. The therapist determined wherein the progression chart the patient falls and from there progression was made to a higher level with the help of techniques listed in Table 2.

Since the outbreak of the 2019 novel coronavirus (COVID-19), the role of physiotherapy for patients with COVID-19 infection has been highlighted by various international guidelines(1,3,7,9,11). Despite that, clinical information regarding the rehabilitation of patients with COVID-19 infection remains limited.

Lee (2020), The case series provided an insight into the physiotherapy management in patients infected with COVID-19 in Singapore. During rehabilitation, exertional or position-related desaturation was a common feature observed in critically ill patients with COVID-19 infection that significantly slowed down the progression of rehabilitation in patients. Our study agrees that positional and exertional desaturation was the main challenge but we devised ways to tackle them in our study while the reported study reported it as a limitation to not to give physiotherapy(6).

Thomas P (2020), outlines recommendations for physiotherapy management for COVID-19 in the acute hospital setting. It includes recommendations for physiotherapy workforce planning and preparation; a screening tool for determining the requirement for physiotherapy; and recommendations for the selection of physiotherapy treatments(5). We agreed to details given in this published study and we devised our way of intervening patients as discussed above in the results section.

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