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Effect of Rehabilitation Program on Dyspnea, Physical activities and Psychological wellbeing among Patients with COVID19

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Abstract

Background: COVID-19 is a contagious beefily infectious respiratory disease; it's a public health emergency that performs varying degrees of respiratory, physical and psychological dysfunction. **Aim of the study**: to evaluate the effect of the rehabilitation program on dyspnea, physical activities and psychological wellbeing among patients with COVID19. **Methods:** quasi-experimental pretest-posttest study. The study was carried out in intensive care (ICU) and post COVID recovery unit at Qena Respiratory Hospital. A convenience sample of 50 adult patients from both sexes. **The study tools; Tool 1**: Self-reports Assessment Questionnaire. Tool **2**: International Physical Activity Scale **Tool 3**: psychological symptoms scale. **Tool 4**: Clinical data base: includes laboratory investigation of lung function and ABGs, addition to chest tomography. **Results**: A significant statistically difference was found regarding symptoms associated total pain, pain intensity, dyspnea scores, physical activities, and psychological wellbeing of the studied sample between the pre and post assessment at the first week and second week post discharge and after the implementation of the rehabilitation program with p= 0.001. **Conclusion:** implementation of the rehabilitation program had statistically significant improvement in dyspnea scores, physical activities, anxiety, depression, pulmonary function, and laboratory investigations among patients with COVID 19. **Recommendation:** rehabilitation programs should be designed and implemented as individualized programs following a comprehensive evaluation.

Keywords: COVID19, Dyspnea, Physical activities, psychological wellbeing &rehabilitation program.

Introduction:

Corona virus disease 2019 (COVID-19) is a highly infective, respiratory disease, caused by a novel corona virus, which univocal a public health emergency that results in changeable stages of respiratory, physical, and psychological dysfunction to patients. Fortunately, plurality patient's experiences mild symptom involves fever, cough, and myalgia **(Fu et al., 2020)**. Moreover, they may be at risk of residual or progressive parenchymal damage with respiratory muscular function impairment these patients can suffers from dyspnea, fatigue at rest, disability during activities of daily living (ADL), exercise intolerance, paucity in nutritional status with a post-traumatic stress disorder (PTSD), anxiety, and depression are all at an elevated risk **(Gandotra et al., 2019) & (Spagnolo et al., 2020).**

Also, the infection can negatively affect additional organs as the heart, kidneys, and brain, with significant impacts on health that may persist. Furthermore, since there are no appropriate antiviral treatments for the corona virus, patients must be isolated and receive intensive care as a treatment technique to alleviate clinical symptoms, enhance lung function recovery, and lower the mortality rate. However, restricted activity space and unintended lengthening of inactive time will originate more substantial reductions in physical activity levels during isolation. **(Bruglier et al., 2020).**

Integrated individualized treatment for patients is coveted. As a result, rehabilitation program (RP) is needed to serve as a reference and starting point for the continuing management of COVID-19 related functional and comorbid rehabilitative issues **(Mane & Memushaj 2018).** Also, RP is individually modified and necessary toward promote recovery, decrease symptoms, improves ventilation, removes secretion, interrupt the unfavorable cycle of reduced physical activity, optimize functional status, increase psychosocial participation which improves patient's quality of life, decreased risk of secondary complications, and minimize health care costs **(Vestbo et al., 2020).**

The rehabilitation program included physical exercise training (activity guidance both endurance and force

upper /lower-limb training), and respiratory physiotherapy (inspiratory muscle training (IMT) **(Lötters et al., 2019).** Breathing exercises, airway clearance techniques, therapeutic education, nutritional improvement, and psychosocial coverage as anxiety management all should be consider within the rehabilitation program **(Gosselink et al., 2019).**
Based on Florence Nightingale's theory rehabilitation is a fundamental nursing concept that nurse's role prevents, repair or respond to patient's needs. As the RP presuppose a holistic approach to care, so nurses' practice within the medical team tends to be a unique attribute of their profession and unique instruments to fight a disorder that actually has no definitive treatment other than supportive care **(Lin & Li 2020).** However, therapeutic nurse-patient relationship is an essential part to get a successful RP which wider role of nurses to have a core function in contribution to assess, plan and evaluate patients' activities of daily living, education to ensure that they understand that exercises are important for improving tolerance, nutritional intake, sleep patterns and anxieties to provide psychological support. Overall, in RP nurses should have an important role in providing evidence-based practice to advance health and self-management, as well as to achieve patient goals **(Yang et al., 2020).**

The Significance of the Study:
COVID-19 is a viral infection that causes widespread respiratory, physical, psychological, and systemic dysfunction. The number of patients with COVID-19 admitted to the intensive care unit (ICU) for isolation in the last year was 1126 cases according to (**Qena Respiratory Hospital Statistical Record., 2020)**. On the other hand, the disease's severity ranges from asymptomatic infection to moderate or severe pneumonia with respiratory failure and/or death. There is a lack of understanding regarding the disease's long-term progress, as well as potential sequels and rehabilitation. Nurses have direct and constant interaction with patients, making them ideally qualified to work as preventive, caregiver, evaluator, and assessor. Meanwhile, she also should promote teaching instructions in the day-to-day treatment they provide. As a result, this research will look into the effects of rehabilitation program on dyspnea, physical activities and psychological wellbeing among patient with COVID19**.**

Aim of the study:
To assess the effect of the rehabilitation program on dyspnea, Physical activities, and psychological wellbeing among patient with COVID19

Hypothesis:
- Patients with COVID19 will exhibit improvement in dyspnea scores, physical activities, and anxiety/depression after implementation of RP than before.
- Mean of pulmonary function, chest CT and laboratory investigations as blood urea nitrogen for patients with COVID19 will be improved post-implementation of the RP than before.

Subjects and Method:

Research Design
Quasi-experimental research design (pre-posttest) was utilized to conduct this study.

Setting
The research was carried out in an isolation intensive care unit (ICU) and post COVID recovery unit at Qena Respiratory Hospital.

Sampling and Sample Size
A purposeful represented sample of 50 adult patients from both sexes were admitted to isolation intensive care unit for COVID19 at Qena Respiratory Hospital. They were selected based on the number of patients with COVID-19 admitted to the intensive care unit (ICU) for isolation in the last year, and by using the following equation according to **(Steven & Thompson., 2012)**

$$n = \frac{N \times P(1-P)}{[N-1 \times (d^2 \div Z^2)] + P(1-p)]}$$

N= total patient population size of 50 who attended the ICU and post COVID recovery unit at Qena Respiratory Hospital
Z= confidence level is 0.95 and is equal to 1.96
D= the error ratio is = 0.05
P= the property availability ratio and neutral = 0.50

The Subjects inclusion and exclusion criteria were:
A purposeful sample of 50 adult patients with COVI-19 were recruited based on the following inclusion criteria: both sexes (male and female), age between 20 and 55 years old, COVID-19 severity levels are mild to moderate, and muscle strength in both upper and lower limbs is greater than Grade 4 according to manual muscle testing (characterized by normal/ good full range of motion against gravity with moderate or maximum resistance). Certain severe respiratory or systemic illnesses, as well critical conditions as (COPD, cystic fibrosis, cardiovascular diseases, and unstable locomotors difficulties), the Glasgow Coma Scale score not less than 15 and other exercise safety contraindications were among the exclusion criteria.

Tools of Data Collection
Tool 1: Self-reports Assessment Questionnaire: was comprised of three parts as the following: -

Part one: Demographic data which included age, gender, level of education, marital status, occupation and smoking habits).

Part two: Pain rating index scores: It is adopted from **(Guillemin F et al., 2017)**. It was translated into the Arabic language and ~~is~~ used to measure pain severity. It is composed of a 10 cm straight line with verbal anchors at both ends that show no pain to the worst pain, with 0 reflecting no pain, 1-3 Mild pain, 4-6 Moderate pain, and 7-10 severe pain.

Part three: The Medical Research Council (MRC) Dyspnea Scale: This tool was adopted from **(O'Donnell al., 2018)**. It aims to measure degree of dyspnea at rest and during effort it consists of five grades ranging from 0 to 5, as follows: G1= 0, G2= 1, G3= 2, G4= 3, G5= 4. Where 0 indicates no dyspnea, 1 indicates mild dyspnea, 2-3 indicates moderate dyspnea, and 4 indicate extreme dyspnea.

Tool II: International Physical Activity (IPA) Scale: It was adopted from **Shiroma & Lee 2017)**. It is a metric for assessing and measuring kinds of physical activities that people do as responses to exercise it scored as mild = 3.3(refer to activities that make breathe somewhat same normal), moderate = 4.0 (refer to activities that make breathe somewhat harder than normal) and vigorous = 8.0(refer to activities that make breathe much harder than normal).

Tool III: psychological symptoms scale: used to assess the anxiety, depression, and insomnia. It is consisting of the following:

Part one: **Generalized Anxiety Disorder-7(GAD-7):** It is developed by **(Spitzer et al., 2016).** The GAD-7 scale has a total score range of (0 – 21). Those who get a score of 0–4 showed to have no anxiety symptoms (explained no feeling nervous, anxious or on edge), those who get a score of 5–9 showed to have a mild anxiety (explained that patient not being able to stop or control worrying). Those who get a score of (10–14) showed to have moderate anxiety (explained that patient so restless that it is hard to sit still), and those who get a score of (15-21) showed to have severe anxiety (explained that patient becoming easily annoyed, irritable or feeling afraid as if something awful might happen)

Part two: **The Patient Depression Questionnaire (PDQ-9):** its assessment questionnaire monitors the severity of depression created by **(Kroenke et al., 2017).** The total score ranges from 0 - 27 points, with 0- 4 suggesting no depressive symptoms (as interest or pleasure in doing things), 5–9 indicating mild depression (as feeling bad and down about yourself), 10–14 indicating moderate depression (as trouble to concentrate on things as reading or watching television), and 15–19 indicating extreme depression (as moving or speaking become so slowly that other could noticed and being so fidgety or restless) lastly from 20–27 denotes severe depression (as thoughts that would be better off dead or of hurting himself in some way)

Part three: **The Athens Insomnia Scale (AIS):** it developed by **(Soldatos & Dikeos 2017)** to assess sleep quality. It composite of 8 items by total score of (0-24), with 0– 4 suggest that no experiencing insomnia (expressed no problem in falling asleep, awake not earlier and might not sleeping during the day); a score from 5-8 indicates that the patient developing mild insomnia (expressed slightly delayed in sleep at bed time, total sleep insufficient, decreased sense of wellbeing during the day with mild sleepiness during the day), score from 9-16 indicates that the patient has considerable insomnia (expressed markedly delayed sleep, final awake earlier sleep unsatisfactory, marked decrease sense of wellbeing or functioning during the day with considerable sleepiness during the day) and score from 17-24 indicates that the patient had intense insomnia (expressed very delayed sleep induction or not sleep during the night, very insufficient sleep at all , very decreased functioning and sense of wellbeing during the day with intense) .

Tool IV: Clinical data base: It contains the following items:

Part one: laboratory investigations assessment (pre/post RP): The following standardized pulmonary diffusion capacity tests were reported by **(Quanjer et al., 2019)**: Forced Vital Capacity (FVC), Forced Expiratory Capacity at First Second of Exhalation (FEV1), total lung capacity (TLC), using an easy one Spiro- meter pre and post RP, and arterial blood gases (ABGs) like PaO2, PaCO2, SO2, also C reactive protein (CRP), erythrocyte sedimentation rate (ESR), blood urea nitrogen (BUN), and lung carbon monoxide diffusion capability are among the tests performed (DLOCO). It used to evaluate the effect of RP on lung function and improving of dyspnea for patients with COVID-19 on four consecutive times include two times as second week of admission in ICU, immediate post discharge from ICU at isolation department (one week later), and during follow up phase 2^{nd} and 4^{th} weeks of discharge from the hospital.

Part two: Diagnostic Studies assessment: which included a chest tomography CT were done aimed to evaluate the consequence of inspiratory turning for patients with COVID-19 on their lung function and respiratory muscles at post-viral negative phase on four consecutive times include two times as second week of admission of ICU, immediate post-discharge from ICU at isolation department (one week later), and during follow up phase 2^{nd} and 4^{th} weeks of discharge from the hospital

Patients and Methods

Administrative approval:

- The dean of the nursing faculty forwarded an official requiring permission to perform the study.
- A printed agreement was obtained from the manager of the intensive care unit (ICU) and post COVID recovery department at Qena Respiratory Hospital to perform the research.

Ethical consideration:

In order to protect the human rights an official permission was taken from ethical committee of facility of medicine (SVU-MED-CHT019-4-21-2-129). After a detailed clarification of the study's objectives, each participant gave their informed consent orally. They were told that participation in the research was completely voluntary and that they could opt out at any time. All information collected will be kept confidential and used solely for research purposes, according to the research sample.

Tool's development:

After undertaking a detailed analysis of the relevant literature, the researcher developed the study tools.

Validity and reliability of the study tools:

Face validity was done by 5 experts from Medical – Surgical Nursing staff and staff of chest who reviewed the tools for clarity, relevance, comprehensiveness, and understanding. Minor modifications were done and correction was carried out accordingly and then the tools were designed in their final format and tested for reliability. Reliability of the too I (part1) and tool IV (part 1 &2) was measured by **Cronbach's alpha coefficient (r-0.72)**

A pilot study:

It was carried out on 10% (5 patients) of study subjects to test the clarity and applicability of the tools. The data obtained from the pilot study were analyzed; no changes were done in the used tools, so all the 10% of subjects selected were included in the study

Data Collection: - Each interview lasted about 10 to 20 minutes. The data was gathered over the course of eight months, from January to August 2020. The following phases were used to collect data:

Assessment phase:

After all the participants confirming criteria of the study the researcher interviewed with each patient individually at the second week of ICU admission whiner viral negative phase and pre-RP to gets their oral consent. A self-report assessment questionnaire (tool 1) was used to collect information about the patients' socio-demographic characteristics (part one). The patients were then evaluated using a standardized questionnaire for pain rating assessment (part two), MRC-dyspnea scale (Part three), international physical activity questionnaire (tool II) and psychological symptoms scale (Tool three part one, two &three) to assess anxiety, depression and insomnia disorder. Then clinical data base (tool IV) as standardized laboratory investigations (part one) were performed for all the participants to evaluate the lung functions for pulmonary diffusion capacity tests using diagnostic Spiro metric, arterial blood gases (ABG), and blood analysis as well as diagnostic study chest tomography (CT) (tool IV –part 2). All was assessed on 2nd week of ICU admission as a baseline assessment before beginning RP (pretest) to comparing with after starting RP on (posttest) 2nd week of ICU admission thin on in isolation department; thin the follow up within 2nd and 4th week of post-discharge.

Rehabilitation program (RP):

After the pretest assessment was made and analyzed the RP was developed based on the identified needs of the patients include ding the study as the following:

This program was developed by the researchers, it is comprehensive tailored intervention based on patient identified needs in the pre assessment stage (analysis of the pretest) that include inspiratory muscle turning, bronchial hygiene exercise (e,g., Diaphragmatic Breathing exercise, Chest wall percussions, Chest wall vibration, Coughing exercise, and Incentive spirometer), Exercise training sessions (e.g., Quadriceps muscular turning and Resistance strength turning), psychosocial counseling, and nutritional counseling.

It designed for patients with COVID-19 to improve their physical condition, ameliorate dyspnea, minimize disability, preserve function, relieve anxiety and depression, and reduce complications.

It was initiated after the first pretest assessment includes: -

A psychological preparation which was carried out by explaining the purpose and effects of pulmonary rehabilitation program. In addition to the medical aerosol was administered bronchodilator medication (2ml farcolin puffs) in addition to mucolytic surp.

Implementation phase:

Procedure:

The intra hospital phase: The first week Program: as the following

Inspiratory muscle training (IMT) sessions:

All subjects exercised their inspiratory muscles twice a day for 15 min four times a week under the supervision of a researcher, as the patients were

expected to breathe slowly with an elevated tidal rate, they could take a brief break by breathing at rest after 10 inspirations. In each session, the 10-inspiration cycle was repeated five times. The inspiratory muscle training was performed with a threshold inspiratory muscle trainer set to a resistance of 50% of the initial maximal inspiratory pressure (PI). For each subsequent training session during the Program, the intensity was raised by 10% until it reached 80%. The secondary endpoints were used to measure of dyspnea using (MRC) Dyspnea Scale and obtaining15 min rest before the next step.

Bronchial hygiene exercises session: as all subjects encouraged to

Diaphragmatic Breathing exercise:

The breathing frequency was from 20-30 times with a 30-60 second rest period for every 5 breaths to prevent hyperventilation. To reduce gasping during breathing, instruct the patient to avoid forced expiration. Semi sitting or sitting is a good position for the patient. The researcher placed the two hands over the epigastric area. Ask the patient to take a few deep breaths in slowly, focusing on allowing the abdominal wall to swell under the researcher's gentle pressure. On expiration the patient notices his abdomen slowly return back to normal. The patient is learning how to always hold both hands on the abdomen. Relax the upper chest and shoulders as well. Expiration is a totally passive process.

Percussions on the chest wall are performed by cupping the hand to create an air cushion involving the researcher's hand and the patient during inspiration. To avoid skin discomfort, a towel should be placed between the patient and the precursor's hand.

Chest wall vibration:

Vibration/shaking is a movement in which the chest wall shakes rapidly during exhalation to carry loose secretions to larger airways where they can be coughed up. This was accomplished by vibrating the patient's thoracic cage by placing both hands over the percussed regions

Coughing exercise:

Instruct the patient to cough vigorously at the end of each breath and expectorate the secretions into tissue. Ask the patient to splint his or her abdomen during coughs and cover the patient's chest with a folded towel or pillow when coughing. After that, the patient should be allowed to rest for 5 minutes before going on to the next step.

Incentive spirometer:

Have the patient sit on the edge of the bed or sit up as much as he can in bed. Instruct the patients to keep the incentive spirometer upright, then place the mouthpiece in his mouth and close his lips tightly around it. gradually and thoroughly inhale and exhale. Take note of the yellow piston as it rises to the top of the column. Ask patient to hold your breath if possible until the yellow indicator reaches the blue outlined patch. Then slowly exhale, allowing the piston to drop to the bottom of the column. After a few moments of rest, repeat all these steps at least 10 times. Cough to ensure the patients' lungs are clear after each series of 10 deep breaths. Enable 5 minutes for the patient to rest before proceeding to the next step.

Exercise training sessions:

consisted of 2 daily training sessions four times a week as 20 minutes on average each as:

Resistance strength turning:

The patient was fully independent, the program focused on passive and active assisted exercises and proprioceptive neuromuscular facilitation (PNF) like range of motion exercise (10 minutes), included whole-body exercise training (10 repetitions for each joint) such as bridging, and core stability exercise. If possible, the patient should be mobilized in a sitting position or with the head raised; this position is more favorable to ventilation.

Quadriceps muscular turning

The patient assisted to train the most powerful muscle of the body as hip flexor and knee extensor with proper positioning during setting in the bed or standing beside it like quad sets, straight leg raise, heel slide, and prone knee bend, also wall squat, lunge, and quadriceps stretch and step up .Each are repeated for 10 times .The exercises were terminated of if any of the following symptoms was reached: worsening of dyspnea, SpO2 decrease by 85% or less, and the heart rate increase to 85% or more of the predicted maximum heart rate.

The second week training: as the following

Moreover, in the second week after confirming COVID-19 negative and patients discharged to the post COVID recovery unit they exercised twice daily for 6 times a week. To increase tolerance to exercise, the patient was encouraged to walk 50 meters every day in self-paced speed. The program was progressed to a harder level as the patient could do all the above exercises independently and without stopping. At this stage, the patient emboldens to without oxygen while concentrated on breathing control

Psychosocial counseling: it includes
Additional yoga turning for decrease anxiety/depression as a complementary resource to help managing anxiety and enhance wellbeing as intention setting, hand gestures, meditation, meditative relaxation, breathing and cleansing practices for 10 minutes.
After the pretest assessment was made, they were given pharmacological bronchodilator drugs based on their needs, and they were advised to do RP, which was administered by the researcher. The researchers prescribed and administered the RP sessions. The daily sessions were done one-on-one and lasted between half an hour to an hour, depending on the condition, requirements, and surrounding conditions of each patient. It was ensured in cooperation with nurses and medical personnel all over the morning and afternoon shift after getting personal protective equipment and all safety measures for protection from transmission of infection to and from the researchers. The RP sessions were held in the presence of a manual booklet to assist and direct him in following the instructions and practicing at home after he was discharged.

Evaluation Phase:
The follow up phase:
After discharged to home the patient followed by over more 4 weeks:
RP was done in an isolated space at home in which vital signs were stable and the patient did not have any limiting issues for daily activities, so the focus of rehabilitation was to achieve the level of independence. In addition to the exercises mentioned in the previous steps, RP activities consisted of exercising in a real environment such as climbing stairs, tread mail, cycling or free walking (10 minutes), adding quadriceps muscle strength and resistance strength training. Also use acapella which is airway clearance device used to help remove mucus (6 breathing cycles every 4 hours), take a reasonably deep breath and hold it for about 3 seconds, then put the acapella mouthpiece in mouth seal, lips tightly around the mouthpiece, and exhale as much as possible (but not too forcefully) through the mouthpiece with cheeks as shape as possible (during exhale without inhaling through the device) repeat this man oeuvre for 10 breaths, trying to resisting the urge to cough. After each round, huff, and cough 3 to 4 times. All follow this by a controlled diaphragmatic breath for 10 times. The exercises were evaluated and followed up through tele-rehabilitation with a Smartphone. The researcher gets down to intimation the patient the important to diet as keeping on increase fluid intake, increase protein to 5g/kg daily, vitamins like vitamin C, Zinc, selenium, and high fiber content meals for improving immunity.
A post-test assessing the efficacy of RP on patients' wellbeing was conducted over two weeks, on the second and fourth weeks after discharge, as a follow-up using their smart phone. This efficiency was determined by comparing pre- and post-test improvements in subjective pain intensity index scores (Tool 1 part II), dyspnea scores (Tool 1 part III), Physical Activity scores (Tool II), and psychological symptoms scores (Tool III), as well as pulmonary function tests and ABGs (Tool IV) was evaluated on 2^{nd} week and 4^{th} week after discharge as follow up and contrast with the baseline assessment that was done on 2nd week of ICU admission.

Statistical Analysis:
The data was processed, coded, and tabulated after it was checked and prepared for computer entry. The computer software SPSS version 18 was used to calculate descriptive statistics such as number and percentage mean scores, and standard deviation. To compare differences in frequency distribution between pre and post study participants, Chi-square, P-value, and t-value were used.

Results

Table (1): Frequency distribution of the studied patients according to their Socio-demographic data (n= 50)

Item	No	%
1- Age:		
• 20< 30	12	24
• 30- < 40	11	22
• 40- < 50	14	28
• 50- ≤ 60	9	18
Mean ± SD: 36.87± 10.**17**		
2- Gender:		
• Male	32	64
• Female	18	36
3- Marital status:		
• Married	28	56
• Widow	8	16
• Divorced	7	14
• Single	7	14
4- level of education:		
• Illiterate	6	12
• Basic education	24	48
• University	20	40
5- Smoking history:		
• Smoker	33	66
• Non-smoker	17	34
• Negative smoker	50	100
6- Occupation:		
• Worker	13	26
• Employee	25	50
• Privet job	12	24

Table (2): Comparison between pre and post rehabilitation program (RP) according to expressed pain among patients with COVIT 19 (n=50)

Variables	Pre test		Post test								Chi square test					
			End of 2ed w of ICU (1)		End of isolation unite(2)		End of 1st w of discharge(3)		End of 2 ed w of discharge (4)		Pre- test versus (1 & 2)		Post- test (1 &2) versus (3).		Post- test (1 &2) versus(4)	
Symptoms associated with pain:	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**X_2**	**P.V**	**X_2**	**P.V**	**X_2**	**P.V**
- Pain at rest	36	72	27	54	19	38	8	16	2	4	11.67	0.003*	15.79	<0.001*	29.96	<0.001*
- Pain on breathing	41	82	30	60	20	40	11	22	7	14	1849	<0.001*	14.97	0.001*	22.58	<0.001*
- Local discomfort	32	64	26	52	14	28	6	30	3	6	13.4	0.001*	19.6	<0.001*	25.88	<0.001*
- Generalized fatigue	50	100	39	78	23	46	12	24	6	12	38.98	<0.001*	29.49	<0.001*	43.95	<0.001*
- Difficult movement	46	92	38	76	23	46	14	28	6	12	26.66	<0.001*	23.52	<0.001*	41.48	<0.001*

Chi-square test, ** significant difference at P-value < 0.05*

Table (3):Comparison between the pre and post rehabilitation program(RP)according to pain intensity index scale among patient with COVIT 19(n= 50)

variable	Pre test		Post test								Chi square test		
			End of 2ed w of ICU (1)		End of isolation unite (2)		End of 1st w of discharge(3)		End of 2 ed w of discharge (4)		Pre- test versus (1 & 2)	Post- test(1 &2) versus (3).	Post- test(1 &2) versus(4)
Total Pain Intensity	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**			
No pain = 0	0	0	0	0	3	6	19	38	43	86	X^2= 39.77 P=<0.001*	X^2=44.56 P=<0.001*	X^2= 114.06 P=<0.001*
Mild pain =(1-3)	0	0	12	24	17	34	19	38	3	6			
Moderate =(4-6)	15	30	20	40	21	42	8	16	3	6			
Severe=(7-10)	35	70	18	36	9	18	5	10	1	2			
Total Mean + SD	7.54±1.88		5.10±2.022		3.96±2.24		2.10±2.10		0.56±1.57		52.78	57.80	79.70
Kruskal-Wallis P value											P=<0.001*	P=<0.001*	P=<0.001*

Chi-square test, ** significant difference at P-value < 0.05*

Table (4): Comparison between pre and post rehabilitation program (RP) according to dyspnea assessment scale among patients with COVID 19 (n= 50)

Variable	Pre test		Post test								Chi square test		
			End of 2ed w of ICU (1)		End of isolation unite (2)		End of 1st w of discharge(3)		End of 2 ed w of discharge (4)		Pre- test versus (1 & 2)	Post- test (1 &2) versus (3).	Post- test (1 &2) versus(4)
Dyspnea Grades:-	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**			
Grade 1(G_1) = 0	0	0	0	0	5	10	30	60	42	84	X^2=36.67 P=<0.001*	X^2=35.97 P=<0.001*	X^2=111.88 P=<0.001*
Grade 2(G_2) = 1	0	0	10	20	5	10	10	20	3	6			
Grade 3(G_3) = 2	0	0	5	10	9	18	0	0	0	0			
Grade 4 (G_4) = 3	10	20	5	10	10	20	1	2	0	0			
Grade 5 (G_5) = 4	40	80	30	60	21	42	9	18	5	10			
Total Mean + SD	3.80±0.40		3.10±1.23		2.74±1.36		1.00±1.52		0.46±1.21		19.43	44.91	70.23
Kruskal-Wallis P value											P=<0.001*	P=<0.001*	P=<0.001*

Chi-square test, ** significant difference at P-value < 0.05*

Table (5): Mean, stander deviation, paired sample t test and p values of physiological statues pre and post rehabilitation program (RP) among patient with COVID 19 (n= 50)

Physiological statues	Pre test Mean ± SD	Posttest Mean ± SD				Kruskal Wallis Test		
		End of 2ed w of ICU (1)	End of isolation unite (2)	End of 1st w of discharge (3)	End of 2 ed w of discharge (4)	Pre- test versus (1 & 2)	Post- test (1&2)versus(3)	Post- test (1 &2) versus(4)
(A):Pulmonary diffusion capacity test:								
- Forced vital capacity **(FVC)** Normal: (80-120)%	71.94±.916	77.00±1.27	77.26±1.60	97.07±4.63	98.80±19.55	100.28 P=<0.001*	99.471 P=<0.001*	103.322 P=<0.001*
- Forced expiratory volume (**FEV1**) Normal: (100 -120)%	71.69±2.21	76.94±0.81	77.18±1.37	97.72±3.79	102.20±40	102.859 P=<0.001*	101.461 P=<0.001*	85.674 P=<0.001*
- Total lung capacity (**TLC**) Normal: (80-120)%	71.50±.67	77.60±1.50	77.60±1.50	98.32±3.67	98.12±18.86	86.184 P=<0.001*	102.602 P=<0.001*	87.389 P=<0.001*
(B):Arterial Blood gas (ABG) test:								
- Partial oxygen Pressure (**PaO2)** Normal :(80-100 mmHg	73.04±0.10	84.12±3.70	4.30±3.58	99.86±0.42	99.86±0.42	102.292 P=<0.001*	101.576 P=<0.001*	101.576 P=<0.001*
- Partial pressure of carbon dioxide (**PaCO2)** Normal: (38-42 mmHg)	38.52±42.62	47.30±1.40	47.18±1.50	35.52±5.22	37.50±2.86	102.581 P=<0.001*	102.635 P=<0.001*	102.858 P=<0.001*
- Oxygen saturation (**SaO2**) Normal :(94-100)%	87.86±1.195	89.16±1.41	89.38±1.75	99.20±0.49	99.54±0.50	27.567 P=<0.001*	104.317 P=<0.001*	103.783 P=<0.001*

Kruskal Wallis test , ** Significant difference at P-value < 0.01*

Table (6): Numbers and percentages , χ^2 test and p values of diagnostic investigation as regard chest CT pre and post rehabilitation program (RP) among patient with COVID 19(n= 50)

Variable	Pre test		Post test								Chi square test		
			End of 2ed w of ICU (1)		End of isolation unite (2)		End of 1st w of discharge (3)		End of 2 ed w of discharge (4)		Pretest with { (1) & (2)}	{ (1) & (2)} with (3)	{ (1) & (2)} with (4)
Chest CT assessment:-	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**χ^2 (P)**	**χ^2(P)**	**χ^2(P)**
- Ground-glass opacity **(GGO)**	20	40	13	26	7	14	6	12	5	10	8.65 (0.015)*	4.01(0.135) ns	4.99(0.08) ns
- Bilateral infiltration	25	50	20	40	11	22	8	16	6	12	8.60(0.014)*	8.10(0.019)*	10.83(0.004)*
- L.S consolidation	30	60	26	52	20	40	15	30	11	22	4.05 (0.14)ns	5.09(0.09)*	9.67(0.009)*
- Bronchiectasis	45	90	40	80	29	58	17	34	12	24	25.38 (<0.001)*	22.41(<0.001)*	31.56(<0.001)*
- Lymphadenopathy	50	100	47	94	40	80	30	60	19	38	13.30(0.001)*	17.01(<0.001)*	40.79(<0.001)*

*Chi-square test, * significant difference at P-value < 0.05* *non-significant difference at P-value > 0.05*

Table (7): Mean, stander deviation, paired sample t test and p values of diagnostic investigation as regard blood chemistry pre and post rehabilitation program (RP) among patient with COVID 19 (n= 50)

Variables	Pre test Mean + SD	Posttest Mean + SD				Kruskal Wallis Test		
		End of 2ed w of ICU (1)	End of isolation unite (2)	End of 1st w of discharge (3)	End of 2 ed w of discharge (4)	Pre- test versus (1 & 2)	Post- test (1 &2) versus (3)	Post- test (1 &2) versus(4)
Blood chemistry assessment								
- C- reactive protein **(CRP)** (normal ↓10 mm/hr)	47.12±3.51	47.20±3.53	35.00±4.23	22.66±1.86	11.34±2.68	95.03 P=<0.001*	130.183 P=<0.001*	130.154 P=<0.001*
- Erythrocyte sedimentation rate **(ESR)** (normal 0-10 mmHg)	43.76±5.18	43.28±5.69	29.54±1.86	18.31±3.98	8.56±1.64	80.97 P=<0.001*	118.792 P=<0.001*	125.595 P=<0.001*
- Blood urea nitrogen **(BUN)** (normal 5-22 mg/dI)	30.70±1.41	29.66±0.71	26.70±2.04	20.10±2.3	11.82±3.29	88.53 P=<0.001*	124.558 P=<0.001*	124.917 P=<0.001*
- Diffusing lung for carbon monoxide **(DLOCO)** (normal 20.79-28.05 ml/min)	40.02±0.95	39.73±0.83	33.29±3.7	27.38±2.48	23.68±2.05	100.54 P=<0.001*	126.231 P=<0.001*	132.077 P=<0.001*

*Kruskal Wallis test , * Significant difference at P-value < 0.01* *non-Significant difference at P-value > 0.01*

Table (8): Comparison between pre and post rehabilitation program (RP) according to physical activity scale (PAS) among patients with COVID 19 (n= 50)

Variable	Pre test		Post test								Chi square test		
			End of 2ed w of ICU (1)		End of isolation unite (2)		End of 1st w of discharge (3)		End of 2 ed w of discharge (4)		Pre- test versus (1 & 2)	Post- test (1&2) versus (3)	Post- test (1 &2) versus(4)
Physical activity assessment:-	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**			
Mild = (1-3)	48	96	37	74	20	40	9	18	4	8	X^2= 39.22 P=<0.001*	X^2=33.76 P=<0.001*	X^2= 48.33 P=<0.001*
Moderate = (4-7)	2	4	10	20	19	38	23	46	23	46			
Vigorous = (8-10)	0	0	3	6	11	22	18	36	23	46			
Total Mean + SD	2.1±0.95		3.12±1.90		4.74±2.54		6.24±2.6		7.40±2.24				
Kruskal-Wallis P value											32.88 P=<0.001*	34.32 P=<0.001*	56.97 P=<0.001*

*Chi-square test, * significant difference at P-value < 0.05* *non-significant difference at P-value > 0.05*
*Kruskal Wallis test , * Significant difference at P-value < 0.01* *non-Significant difference at P-value > 0.01*

Table (9): Comparison between pre and post rehabilitation program (RP) according to psychological symptoms scale (PSS) among patients with COVID 19(n= 50)

Variables	Pre test		Post test								Chi square test		
			End of 2ed w of ICU (1)		End of isolation unite (2)		End of 1st w of discharge (3)		End of 2 ed w of discharge (4)		Pre- test versus (1 & 2)	Post- test (1 &2) versus (3)	Post- test (1 &2) versus(4)
Generalized anxiety disorder:	No	%	No	%	No	%	No	%	No	%			
- No anxiety (0-4)	0	0	0	0	25	50	42	84	42	83	80.83	85.88	111.05
- Mild anxiety (5-9)	0	0	2	4	0	0	0	0	8	16	P=<0.001*	P=<0.001*	P=<0.001*
- Moderate anxiety (10-14)	5	10	11	22	15	30	3	6	0	0			
- Severe anxiety (≥ 15)	45	90	37	74	10	20	5	10	0	0			
Total Mean + SD	14±1.01		13.68±2.28		7.78±5.16		4.28±4.35		3.12±2.65				
Kruskal-Wallis											65.33	65.62	85.67
P value											P=<0.001*	P=<0.001*	P=<0.001*
Depression disorder:													
- No depression (0-4)	0	0	9	18	25	50	40	80	42	84			
- Mild depression (5-9)	35	70	30	60	20	40	10	20	8	16	38.12	42.08	46.65
- Moderate depression (10-14)	5	10	5	10	1	2	0	0	0	0	P=<0.001*	P=<0.001*	P=<0.001*
- Severe depression (15- 19)	10	20	6	12	4	8	0	0	0	0			
- Extremely severe (20-27)	0	0	0	0	0	0	0	0	0	0			
Total Mean + SD	8.48±3.78		6.92±3.72		5.54±3.61		3.60±2.31		2.66±2.17				
Kruskal-Wallis											23.12	32.16	46.57
P value											P=<0.001*	P=<0.001*	P=<0.001*
Insomnia disorder:													
- No insomnia (1-3)	5	10	7	14	38	76	43	86	46	92	61.76	63.02	71.70
- May be develop(4-6)	30	60	29	58	7	14	5	10	2	4	P=<0.001*	P=<0.001*	P=<0.001*
- Has insomnia (7-10)	15	30	14	28	5	10	2	4	2	4			
Total Mean + SD	5.58±1.98		4.90±1.96		3.42±1.86		2.30±1.47		1.62±1.44				
Kruskal-Wallis											32.45	47.39	67.83
P value											P=<0.001**	P=<0.001*	P=<0.001*

*Chi-square test, * significant difference at P-value < 0.05* *non-significant difference at P-value > 0.05*
*Kruskal Wallis test , * Significant difference at P-value < 0.01* *non-Significant difference at P-value > 0.01*

Table (10): Correlation between patient's Dyspnea score, Pain scale and Physical activity with Psychological status among COVID 19 patient throughout the Study Phases

Variables	Dyspnea				Pain scale				Physical activity			
	End of 2ed w of ICU (1)	End of isolation unite (2)	End of 1st w of discharge (3)	End of 2ed w of discharge (4)	End of 2ed w of ICU (1)	End of isolation depart. (2)	End of 1st w of discharge (3)	End of 2ed w of discharge (4)	End of 2ed w of ICU (1)	End of isolation depart. (2)	End of 1st w of discharge (3)	End of 2ed w of discharge (4)
	R	R	R	R	R	R	R	R	R	R	R	R
Physical activity	0.455-*	0.811-**	0.651-**	0.575-*	.431-**	0.782-**	0.664-**	0.707-*	-	-	-	-
Psychological status:												
• **Anxiety**	0.908**	0.792**	0.891**	0.811**	0.813**	0.891**	0.879**	0.772**	0.632-	0.661-**	0.639-**	0.586-**
• **Depression**	0.610**	0.690**	0.874**	0.880*	0.804**	0.802**	0.852**	0.836*	0.214-	0.641-**	0.678-**	0.661-**
• **Insomnia**	0.603**	0.676**	0.853**	0.917**	0.764**	0.796**	0.873**	0.956**	0.324*	0.557-**	0.570-**	0.663-**
Pain	0.830**	0.923**	0.847**	0.958**	-	-	-	-	-	-	-	-

Statistically significant correlation at P-value= <0.05* * Statistically significant correlation at P-value= <0.01*

Table (1): It was found that the majority of the patients in the study were men between the ages of 40 and 50 years old with a mean 36.87± 10.17 respectively. Regarding their marital status 56% of the studied sample were Married, near half (48 %) of them were basic education and 100 % were negative smoker, and 50% of the patients were Employee.

Table (2): It revealed that almost all the patients complained of local discomfort and difficult moving, at the same time the majority of them complained of pain at rest and on breathing with more than half seafaring from local discomfort by (100, 92, 82, 72, and 64%) respectively during pretest assessment preprogram implementation. There was statistically significant decreased in the persistence problems associated with pain with post rehabilitation program practice (p=<0.005) at the 1st (end of isolation unite). Furthermore, the results showed that all pain-related symptoms improved substantially from the first assessment of post-discharge at the end of the first week of discharge and the end of the second week of discharge of follow up in terms of pain at rest, pain on breathing, local discomfort, and difficulty moving on pain with P= 0.001.

Table (3): Explore significant differences in pain intensity pre and post implementation of the RP in patients with COVID19. It revealed that all the studied subjects had a significant difference in decrease pain intensity between pre (mean= 7.54±1.88) and post application of RP before discharge and at the end of 2ed w of ICU. Also, at the end of isolation unite as 5.10±2.022, 3.96±2.24 respectively. In addition, there was further improvement in the follow at end of 1st w of discharge and end of 2ed w of discharge as 2.10±2.10 and 0.56±1.57 respectively. This showing significant difference between Pre- test versus 1 & 2, Post- test 1 &2 versus 3 and Post- test 1 &2 versus4 by Kruskal-Wallis test with (P=<0.001*, P=<0.001*, and P=<0.001*), respectively.

Table (4): It exposed that the greater part of the entire studied sample had severe dyspnea before rehabilitation program practice with mean score (3.80±0.40). It was improved with a statistically significant post practice the RP at the end of 2ed w of ICU, with a total mean score (3.10±1.23) with (P=<0.001*) respectively. Also, the finding revealed that (80%) of the studied patients had sever dyspnea pre-RP compared with (18%) at first follow up at the end of 1st w of discharge and (10%) at the end of 2 ed w of discharge with highly significant improvement between them with (P=<0.0001*).

Table (5): It revealed that in the posttest pre discharge there was significant improved as regarded to Pulmonary diffusion capacity (T test = 6.154) with (P value =<0.001*) it was still significant improved till post discharge to (T test = 6.156) with (P value =<0.001*). The highly significant difference was also found between pre discharge as (T test = 6.157) with (P value =<0.001*) and post discharge (T test = 6.159) with (P value =<0.001*) concerning ABGs test, respectively.

Table (6): It showed that, (100%) of the studied patients had lymphadenopathy followed by (90%) of them had I.T Bronchiectasis, (60%) of them had L.S consolidation, and (50%) of them had Bilateral infiltration at pre-RP which changed into 60.0%, 34 % ,30 % and 16% respectively at first follow up at the end of 1st w of discharge and into 38%, 24% , 22% and 12%, respectively in at the end of 2ed w of discharge with highly significant improvement between them (P=<0.0001*).

Table (7): Represents the diagnostic investigation for blood chemistry pre and post (RP) in patient with COVID19. It revealed that in the posttest pre discharge there was significant improved as regarded CRP, ESR, BUN and DLOCO (T test = 3.548) with (P value P=<0.001*) it was still significant improved till post discharge to (T test = 6.155) with (P value P=<0.001*), respectively.

Table (8): It Illustrated that the majority of entire studied sample practice mild physical activities during pretest assessment with mean score 2.1±0.95. It was enhanced with a statistically significant post application of RP at end of 2ed w of ICU, with a total mean score 3.12±1.90 with P=<0.001* respectively. Also, the finding revealed that 96% of the studied patients had limitation in physical activity pre-RP compared with 18% at first follow up at the end of 1st w of discharge and 8% at the end of 2ed w of discharge with highly significant improvement between them (P=<0.0001*).

Table (9): This table indicates the severity of patients' anxiety, depression, and Insomnia levels pre and post RP among patients with COVID 19. It revealed that 90% of patients were having severe anxiety and 10% of them had moderate anxiety pre implementation of the RP, which changed into 10% and 6% respectively at first follow up at the end of 1st w of discharge than changed into 0 % and 0%, respectively at the end of 2ed w of discharge with highly significant improvement between them (P=<0.0001*). Moreover, there is a highly statistically significant difference between the mean scores of anxiety level for patients with COVID19 pre and post RP (P< 0.001). It also revealed that, 70% of patients had mild depression followed by 10% of them had moderate depression and 20% of them had severe depression pre- RP implementation, which changed into 10%, 0% and 0%, respectively at first follow up at the end of 1st w of discharge and into 8%, 0% and 0% , respectively at the end of 2ed w of discharge with highly significant

improvement between them (P=<0.0001*). Moreover, there is a statistically significant difference between the mean scores of depression level for patients with COVID19 pre and post RP implementation with (P< 0.001*).The same table illustrates that (30%) of patients who had insomnia followed by 60% of them may develop insomnia and (10%) of them had no insomnia at pre RP implementation, which changed into4%, 10% and 86%, respectively at first follow up at the end of 1st w of discharge and into 4%, 4% and 92%, respectively at the end of 2ed w of discharge with highly significant improvement between them (P=<0.0001*).. Moreover, there is a statistically significant difference between the mean scores of insomnia levels for patients with COVID19 pre and post RP implementation with (P< 0.001*).

Table (10): This table showed that, there was significant negative correlation between level of physical activity with dyspnea, pain level and psychological status (anxiety, depression and insomnia) at end of 2ed w of ICU, at end of isolation unite, at End of 1st w of discharge and end of 2 end w of discharge at p value(<0.001*) . The same table illustrated that, there was positive correlation between level of pain with dyspnea level and psychological status (anxiety, depression, and insomnia) at end of 2ed w of ICU, at end of isolation unite, at end of 1st w of discharge and end of 2 end w of discharge at p value (<0.001*). It also revealed that there was positive correlation between dyspnea level and psychological status (anxiety, depression and insomnia) at end of 2ed w of ICU, at end of isolation department, at End of 1st w of discharge and end of 2 end w of discharge at p value (<0.001*).

Discussion

COVID-19 is caused by the extreme acute respiratory syndrome corona virus 2 (SARS-CoV-2) **(Lu et al., 2020)**. It transmitted from one person to another as cross-transmission **(Wan et al., 2020)**. Lung damage being one of the most common of clinical manifestations. Principle of pulmonary rehabilitation in patients with COVID-19 is to improve dyspnea, reduce anxiety, decrease complications, reduce weakness, maintain function, and improve quality of life and should be considered throughout the acute management and post discharge of COVID-19 as it is safe. **(Guo et al., 2020).**

The goal of the current study was to assess the effect of the rehabilitation program (RP) on dyspnea, physical activities, and psychological wellbeing among patient with COVID19. Long-term studies done by **(Jia et al., 2020)** concerning exercise capacity, Dyspnea and Psychological wellbeing among patient with COVID-19 are lacked**.** In this accomplishment, 50 patients with COVID-19 were studied; they were encouraged to perform physiotherapy rehabilitation program sessions

The findings of this study exposed that the greater part of the studied sample was male and between the ages of 40 and 50, that half of the sample was married, and that approximately half of them had only a basic education. This was in line with previous research, which stated that the subjects were between the ages of 45 and 55 and were married. From the research point of view, this result may be due to the age go 40 years old considered one of the risk factors of COVID 19 as this age of more exposure to infection during work contact

(Lin & Li 2020) also in their study the sample were negative smoker. In the same context, (**Ibrahim 2019)** claims that active or passive smoking can increase pulmonary secretion and impair ciliary function, which can lead to a longer recovery time due to respiratory complications.

It was found in this study that the progressive improvement in pain. Concerning the impact of chest physiotherapy on patients' with COVID19 articulated symptoms associated pain, it was noticed that statistical significant reduction in the persistence problems related pain during the two weeks hospitalization and high significant improvement from 1st assessment to post-discharge at end of 1st w of discharge and end of 2ed w of discharge at the follow up period related to pain at rest, pain on breathing, local discomfort, and difficulty moving on pain comparing with pretest assessment before RP implementation. This result is confirmed by (**Husain et al., 2020),** who claimed that patients suffering from debilitating covid-19-related symptoms such as exhaustion, chest pain, and muscle pain should be advised to take extended periods of rest, which can lead to physical deconditioning, and that returning to exercise is necessary to help patients regain full function and avoid long-term impairment following infection with covid-19.

In terms of pain intensity in patients with COVID19, this study found that there was a significant difference in pain intensity reduction between pre and post application of RP at the time of discharge, the end of the second week of ICU, and the end of the isolation unite. Also, it was still improved in the follow at end of 1st w of discharge and end of 2ed w of discharge.

In the same context, studies reported that Corona virus leads to neuromuscular disorders causing a relevant disability in the life span (**Guidon & Amato 2020)**, these include intolerant disorders, severe skeletal muscle pain, and chronic inflammatory demyelinating poly ridicule- neuropathy, requiring strict follow-up, essential muscle rehabilitation and physical exercise (**Siciliano et al., 2019)**. Patients, with COVID19, require active physical activity, such

as daily exercise, to relieve pain, enhance muscle strength, endurance ability, and avoid osteoarticular problems caused by disuse. **(Solé et al., 2020) & (Jukic et al., 2020)**.

The patients in this study revealed that the majority of them had severe dyspnea which improved with statistically significant post rehabilitation program practice at end of 2ed w of ICU, end of isolation unite also with highly significant improvement at the end of 1st w, 2ed w of discharge. This finding is supported by **(Spruit et al., 2020),** who claimed that the aim of patient with COVID 19 pulmonary rehabilitation is to improve dyspnea symptoms, minimize complications, and maintain function, also **(Gail et al., 2020)** concluded in their study that rehabilitation programs is needed to improv the modified Borg dyspnea scales also Patients will require skilled monitoring for exercise responses correctly.

This study revealed that the physiological status of pulmonary function test and arterial blood gases (ABGs) pre and post RP implementation among patients with COVID 19, as the posttest pre discharge showed significant improvement as regarded to pulmonary diffusion capacity and still showed significant improved till post discharge. Also, it was noticed that highly significant difference was also found between pre and post discharge concerning ABGs test. This result is supported by (**Ramsook et al., 2020),** who confirmed that Exercise therapy, along with respiratory physiotherapy, leads to open the collapsed alveoli, which prevents decreased lung function and atelectasis, resulting improving in the perfusion-to-ventilation ratios. Moreover, respiratory physiotherapy approach improves diaphragmatic function as the most essential respiratory muscle which improves the tidal volume. According to (**Fumagalli et al., 2020),** pulmonary function tests improved dramatically in the first two weeks after engaging in a rehabilitation program, and its usage has been related to an improvement in tidal volume, functional residual capacity (FRC), lung compliance, vital capacity, and PO2 levels, while (**Liu et al., 2020)** confirmed that a six-week respiratory rehabilitation program would effectively enhance respiratory function among patients with COVID-19

Respiratory rehabilitation provided an intensive cycle of breathing strategies that utilizes a mixture of airway clearance techniques to ventilate obstructed lung segments while also improving oxygen consumption **(Kang & Bach JR ., 2020)**.

The results of this study revealed that during pretest all the studied patients had lymphadenopathy followed by the majority of them had bronchiectasis, simultaneous with two third had lateral segment consolidation, and half of them had bilateral infiltration at pre-RP implementation with highly significant improvement post RP application. This agreed with a new study done by **(Chung et al., 2020)** Who reported that chest computed tomography (CT) plays an essential role in the evaluation of COVID-19. Lymphadenopathies, Peripheral posterior bilateral ground-glass opacities (GGO) with or without consolidation were the main characteristic of COVID-19. This shows the time it takes for the pathological transformation from early-stage interstitial edema or hyaline membrane injury to the influx of exudates and frank alveolar involvement. Bronchiectasis, cavitation, and nodules can indicate an infection that is more aggressive or superimposed. **(Wu et al., 2020)**.

Regarded CRP, ESR, BUN and DLOCO, still showed significant improved till post discharge this results assured by in his study **(Shephared., 2020),** as he concluded that moderate intensity exercise reduce and suppress inflammatory markers coincide with CRP and ESR which lead to improve disease management as physical activity which has frequently been suggested as adjuvant therapy option in the treatment of patients with COVID19 also it seem to have immune modulating potential.

According to **(Mayer et al., 2019)** The presence of chronic inflammation-immunosuppression and catabolism syndrome in patients with COVID-19 is suggested by a higher level of urea nitrogen. Urea nitrogen has been linked to elevated risk of severe COVID 19. As a result, the physical activity lowers urea nitrogen levels, making it easier to centralize management and rehabilitation treatment for severely ill patients. Also, DLCO abnormalities suggested pulmonary fibrosis or a late stage in the healing process **(McKoy et al., 2020)**. D-dimer elevation has been identified as a significant laboratory finding in patients with COVID-19 that needs special attention, as D-dimer on admission was an independent predictor of in-hospital fatality for patients with COVID-19 **(Kang., 2020)**. Thus, even in the absence of serious respiratory symptoms, pulmonary rehabilitation should be expected for patients with a markedly elevated D-dimer **(Chlif et al., 2020)**

In the case with physical disabilities, this could hinder patients from doing what they usually would. Our study illustrated that patient were reported that the majority of entire studied sample practice light limited physical activities during pretest assessment. It was improved with statistically significant post application of RP during the period of hospital follow up to highly significant improvement after discharging. In recent studies patients with COVID 19 have been shown to have exercise intolerance, a decreased desire to engage in everyday activities, a lower health-related quality of life, and a higher usage of health-care services **(Vestbo et al., 2019)**.

Pulmonary rehabilitation is a non-drug management that involves physical exercise instruction, behavioral modifications encouragement, and physical activity stimulation. Through pulmonary rehabilitation exercise training, patients could accomplish their goals of enhancing peripheral muscle performance and intensification respiratory muscles, expectoration, lung compliance, and vital capability as stated by (**Chen et al., 2020).**

It was found in this research that during pretest the greater part of the study sample had severe anxiety and more than two third had mild depression also one third of patients who seafaring insomnia while the remaining two third developed insomnia this results changed to highly significant improvement since starting the implementation of the RP tile the end of the study,

This is consistent with the result of study done by **(Yates et al., 2020),** who reported isolation and quarantine reduced the population's physical and social behaviors, leading to an increase in the incidence of mental illness. Depression, anxiety, and insomnia are mainly common mental illnesses conferring a severe impact on individuals life quality so regular exercise, such as Yoga and, especially, Vini-yoga, which coordinates breathing with arm lifts or body positioning during the inspiratory or expiratory process, singing, and the use of timed breathing techniques, significantly reduces the risk of anxiety and depression and is considered to be beneficial against insomnia.

Since the patient was afraid of the severe consequences, quarantine, and spreading the virus to their family and friends with insufficient knowledge and financial loss, exercise as relaxation methods, breathing exercises, and Yoga were prescribed as one of the measures to improve mental wellbeing and cope with anxiety. Low mood, shame, reduced appetite, reduced sleep quality, helplessness; low self-esteem exhaustion, psychomotor retardation, and low interest in social contact were all present in the hospital isolated patient, all these stressful events with hypercortisolism contributing risk factors for depression and insomnia. **(Daniele et al., 2020).**

As regarded correlation between patient's dyspnea score, pain scale and physical activity with psychological status among patient with COVID 19 throughout the study phases our results showed that, there was significant negative correlation between level of physical activity with dyspnea , pain level and psychological status this completely agrees with (**Brooks et al., 2019)** who stated that RP is individually modified and intended to alleviate symptoms, improve functional status, increase engagement, and reduce health care costs by stabilizing or reversing systemic manifestations of the disease. **Soicher et al., 2020** confirmed that RP is a multidisciplinary, evidence-based approach to treating the patient as a whole physically and psychologically, not just the pulmonary component of the disease.

Conclusion:

On the light of current study results, it can be concluded that implementation of rehabilitation program had statistically significant improvement in dyspnea scores, physical activities, anxiety, depression, pulmonary function, and laboratory investigations among patients with COVID 19, these findings justified the research hypothesis

Recommendation:

1. Rehabilitation programs for patients with COVID19 should be designed and implemented as individualized programs following a comprehensive evaluation.
2. Emphasize the importance of a continuing rehabilitation program for discharged patients, with a special focus on patients with comorbidities.

References

- **Brooks D., Sottana R., Bell B., Hennal M., Laframboise L & Selvanoyagarajah S, .(2019):** Characterization of pulmonary rehabilitation programs in Canada. Can Respir. J. 2019;14:87-92.
- **Bruglier L., Spine A., Castellazzi P., Cimino P., Tettamanti A. & Houdayer E., (2020):** Rehabilitation of COVID-19 patients. J. Rehabil. Med. 52:jrm00046. doi: 10.2340/16501977-2678
- **Chen J., Wang Z. & Nie J., (2020):** The Application of Eight-Segment Pulmonary Rehabilitation Exercise in People with Coronavirus Disease 2019. Journal Frontiers in Physiology. 11:646. doi: 10.3389/fphys.2020.00646
- **Chlif M., Temfemo A. & Keochkerian D., (2020):** Advanced mechanical ventilatory constraints during incremental exercise in covid 19 male subjects. Respir Care J purnal 2020;60: 549–60
- **Chung M., Bernheim A., Mei X., Zhang N., Huang M. & Zeng X., (2020):** CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV). Radiology J China. 295(1):202–207
- **Daniele T., Debruin Ph. & Rios ER., (2020):** Effect of exercise on depressive behavior and striatal level of norepinephrine serotonin and their metabolites in sleep deprived patient during coved 19 pandemic (2020): 332:16-22 Am. Journal of Psychology.
- **Fu B., Xu X. & Wei H., (2020):** Why respiratory rehabilitation program could be an effective with

treatment of severe COVID-19? J. Transl. Med. 18:164. doi: 10.1186/s12967-020-02339-3

- **Fumagalli A., Misuraca C., Bianch A., Noemi B., Simone L. & Maggiolini S ., (2020):** Pulmonary function in patients surviving to COVID-19 pneumonia .Springer Nature 2020
- **Gail D., Raymond A., Marlo B. & Mohit B.,(2020):** Delivering pulmonary rehabilitation during the COVID-19 pandemic: A Canadian Thoracic Society position statement, Canadian Journal of Respiratory, Critical Care, and Sleep Medicine (2020)
- **Gandotra S., Lovato J. & Case D., (2019):** Physical function trajectories in survivors of COVID-19. Ann Am Thoracic Soc. 2019; 16:471-7
- **Gosselink R., DeVos J. & vanden SP., (2019):** Impact of inspiratory muscle training in patients with COVID-19: what is the evidence? Eur Respir J 2019; 37: 416–425.
- **Guidon AC. & Amato AA., (2020):** COVID-19 and neuromuscular disorders. Neurology J of China 94(22):959–969
- **Guillemin F., Paul D., Virion JM. & Briançon S., (2017):** Bias and Precision in Visual Analogue Scales: A Randomized Controlled Trial. Am J Epidemiology 2017; 150(10):1117-27.
- **Guo YR., Cao QD. & Hong ZS., (2020):** The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. Mil Med Res 2020; 7:11
- **Husain L, Grcenhalgh T., Knight M., Acourt C. & Buxton M,. (2020):** Management of post- acute covid 19 in primary care, British Medical Journal, 2020: m 3026
- **Ibrahim BM., (2019):** Management of Severe Chest infection, Analysis of the Results of 144 Patients. J Egypt Soc Cardio-Thoracic Surg 2019; 20(3-4):205.
- **Jia HP. Look DC. Shi L., Hickey M., Pewe L. & Netland J, (2020):** ACE2 receptor expression and severe acute respiratory syndrome coronavirus infection depend on differentiation of human airway epithelia. J Virol 2020; 79:14614-21.
- **Jukic I., Callej G., Cos F., Cuzzolin F., Olmo J. & Terrados N., (2020):** Strategies and solutions for team sports athletes in isolation due to COVID-19. Sports Am. J 8(4):56
- **Kang SW. & Bach JR, (2020):** Maximum insufflation capacity: vital capacity and cough flows in COVIT 19 patient. Am J Phys Med Rehabil 2020;79:222–7
- **Kroenke K., Spitzer RL. & Williams JB., (2017):** The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2017 Sep;16 (9):606-13
- **Lin L. & Li TS., (2020):** Interpretation of "Guidelines for the Diagnosis and Treatment of Novel Coronavirus (2019-nCoV) Infection by the National Health Commission (Trial Version 5)"[in Chinese]. Zhonghua Yi XueZaZhi 2020;100:E001
- **Liu K., Zhang W., Yang Y., Zhang J., Li Y. & Chen Y., (2020):** Respiratory rehabilitation in Adult patients with COVID-19: a randomized controlled study. Complement Ther Clin Pract. 2020;39:101166.
- **Lötters F., vanTol B. & Kwakkel G.,(2019):** Effects of controlled inspiratory muscle training in patients with COVID-19: a meta-analysis. Eur Respir J 2019; 20: 570–577.
- **Lu R., Zhao X. & Li J., (2020):** Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet 2020; 395(10224):565–74.
- **Mane E. & Memushaj L., (2018):** The Effects of Respiratory Physiotherapy in Pneumological Patients due to COVID-19. J Assoc Institute Eng. Language Am. Stud. 2018 Sep 9; 7(8):83-90.
- **Mayer AF., Karloh M. & Dos Santos K., (2019):** Effects of acute use of pursed-lips breathing during exercise in patients with covid 19: a systematic review and meta-analysis. Physiotherapy 2019; 104:9–17
- **McKoy NA., Saldanha IJ. & Odelola OA., (2020):** Active cycle of breathing technique for lung fibrosis within COVIT 19 patient. Cochrane Database Syst Rev 2020;12:CD007862
- **O'Donnell DE., Aaron S., Bourbeau J., Hernandez P., Marciniuk D. Balter, M., (2018):** Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease – 2018. Canadian Respiratory Journal, 10 (Suppl. A), 11A-65A
- **Quanjer PH., Tammeling GJ., Cotes JE., Pedersen OF., Peslin R. & Yernault JC., (2019):** Lung volumes and forced ventilatory flows. Report Working Party Standardization of Lung Function Tests, European Community for Steel and Coal. Official Statement of the European Respiratory Society. Eur Respir J Suppl2019; 16:5-40.
- **Ramsook AH., Molgat Y., Schaeffer MR., Wilkie SS., Camp PG. & Reid WD., (2020):** Effects of inspiratory muscle training on respiratory muscle electromyography and dyspnea during exercise in healthy men. J Appl Physiology. 2020 May 1; 122(5):1267-75.
- **Shephared RJ.,(2020):** the case for increased physical activity in covid 19 quarantine patient: a brief review, Int J Sports Med. 2020; 37:505-15
- **Shiroma EJ. & Lee I., (2017):** Physical activity and respiratory health: lessons learned from epidemiological studies across age, gender, and race/ethnicity. J Am Respiratory Assoc 122, 743–752.

- **Siciliano G, Schirinzi E, Simoncini C, & Ricci G (2019): Exercise** therapy in muscle diseases: open issues and future perspectives. Acta Myol 38(4):233–238
- **Soicher JE., Mayo NE., Gauvin L., Hanley JA., Bernard S. & Maltais F., (2020):** Trajectories of endurance activity following pulmonary rehabilitation in COVID patients. Eur Respir J: Off J Eur SocClin Respir Physiol. 2020; 39:272---8.
- **Soldatos, C. & Dikeos D., (2017):** Athens Insomnia Scale: validation of an instrument based on ICD-10 criteria. J. Psychosom. Res.48, 555–560 (2017).
- **Solé G., Salort E,. Pereon Y., Stojkovic T., Wahbi K. & Cintas P., (2020):** Guidance for the care of neuromuscular patients during the COVID-19 pandemic outbreak from the French Rare Health Care for Neuromuscular Diseases Network. Rev Neurol (Paris) 176(6):507–515
- **Spagnolo P., Balestro E. & Aliberti S., (2020):** Pulmonary fibrosis secondary to COVID-19: a call to arms? Lancet Respir Med 2020. Doi: 10.1016/S2213-3600(20)30222-8
- **Spitzer R ., Kroenke K., Williams J., & Löwe B., (2016):** A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch. Intern. Med.166, 1092–1097 (2016).
- **Spruit MA., Singh SJ. & Garvey C., (2020):** An official American thoracic society: Key concepts and advances in pulmonary rehabilitation. American Journal of Respir Crit care Med; 188: e13-e64.
- **Steven K. & Thompson., (2012):** Sample size, Sampling, chapter (4). 3 rd ed., Wiley, P.p 59-60.
- **Vestbo .J, Hurd SS., Agusti AG. & Jones PW., (2019):** Global strategy for the diagnosis, management, and prevention of corona virus: GOLD executive summary. Am J Respir Crit Care Med. 2019;187:347---65
- **Vestbo J., Hurd SS., Agusti AG., Jones PW., Vogelmeier C. & Anzueto A,.(2019):** Global strategy for the diagnosis, management, and prevention of COVID-19: GOLD executive summary. Am. J Respir Crit Care Med. 2019; 187:347---65
- **Wan Y, Shang J, Graham R, Baric RS, & Li F,. (2020):** Receptor Recognition by the Novel Coronavirus from Wuhan: an Analysis Based on Decade-Long Structural Studies of SARS Coronavirus. J Virol 2020; 94:e00127-20.
- **Wu J., Wu X., Zeng W. & Guo D,. (2020):** Fang Z Chest CT findings in patients with corona virus disease 2019 and its relationship with clinical features. Investigative- Radiology J . 2020;55:257. [PMC-free article] [PubMed] [Google Scholar]
- **Yang F., Liu N. & Hu JY., (2020):** Pulmonary rehabilitation guidelines in the principle of 4S for patients infected with 2019 novel coronavirus (2019-nCoV) [in Chinese]. ZhonghuaJie He He Hu Xi ZaZhi 2020; 43:180–2
- **Yates BE., Deletter MC. & Parrish EM., (2020):** Prescribed exercise for the treatment of depression in college population during covid 19 pandemic. Perdpect psychiatric care journal (2020), 56:8, 94-9. 10.1111/ ppc.12, 508 pub Med