Tele-Rehabilitation Program for older adults Post COVID-19

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Abstract

Background: Tele-rehabilitation" means delivery of rehabilitation care services via a number of technologies to older adults Post COVID which characterized with lung impairment, decrease activities of daily living, risk of depression, anxiety, and poor quality of life. **Aim:** The study **aimed to** evaluate the effectiveness of tele-rehabilitation program for older adults post COVID-19**. Study design:** A quasi-experimental design was used to conduct this study. **Subject:** A purposeful sample consisting of 112 older adult posts COVID-19. **Setting:** This study was conducted in the Ain Shams University Specialized Hospital El Obour, Egypt. **Tools:** Self-reported electronic questionnaire was designed in Arabic language to collect data through Microsoft form which consisted of 5parts to assess demographic data, activities of daily living, quality of life, depression, and anxiety level. **Results:**41.1% of the studied sample ranged between 65: < 70 years, 93.8% of them suffered of comorbidity, 87.5% suffered of breathlessness, 50.9% were dependent, 63.4% experienced poor quality of life, 18.8% of them suffered from severe depression and 22.3% severe anxiety, preprogram intervention which significantly improved post program implementation. Also, there were positive correlation between rehabilitative care practices post COVID-19 and activities of daily living, and quality of life while negative correlation with depression and anxiety level with p value < .001. **Conclusion:** The study proved that the tele- rehabilitation program for older adult post COVID-19 was effective to optimize functioning of activities of daily living and which lead to improve independence level, and maximize quality of life, further, to relieve anxiety and depression. Significantly with p value < 0. 001. **Recommendation**: Further research to identify obstacles that have been associated with applications of tele-communication technology, more home-based programs, and enhancing the resilience of older adults to cope with stresses of COVID-19.

Keywords: Tele-Rehabilitation, older adult, Post COVID-19

Introduction

COVID-19 is the extremely contagious disease which caused by brand-new corona virus that started in Wuhan, China, in December 2019, so it named coronavirus disease -19 (COVID-19). Then it became an international pandemic, which transmitted from person to person through sneezing and coughing droplets. This virus has symptoms and signs that are comparable to the common cold, but it is dangerous for people and if it is not treated by medical professionals and reported promptly, it can cause serious sickness in people and even cause death. The serious complications is more likely to affect older people and especially those with underlying medical illnesses including cancer, diabetes, cardiovascular disease, or chronic respiratory diseases. **(WHO, 2019).**

The term "post COVID-19," also referred to as "long COVID," describes COVID's impact on some individuals who continue to have physical or mental symptoms more than a year after receiving COVID-19. An increased risk of post COVID appears to exist among older persons who had undergone hospitalization or who required intensive care throughout their recovery. Patients may experience this syndrome weeks or months after the initial infection. **(WHO a, 2020).**

The **World Health Organization (b 2020)** indicated the impairments associated with severe critical cases of post COVID-19 are impaired lung functions, physical deconditioning, and muscle weakness. Impaired cognition as memory, attention, concentration, and executive functions which a likely consequence of virus migration to the brain and an adverse effect of hypoxic encephalopathy in post intensive care syndrome, also impaired mental health such as develop anxiety and depression, plus difficulty managing activities of daily living.

The delivery of rehabilitation through a variety of technologies is referred to as "tele-rehabilitation" (TR). Various rehabilitation services, including "examination, evaluation, monitoring, prevention, intervention, supervision, education, consultation, and coaching," are

included in tele-rehabilitation (TR). **(Cowper et al., 2019)**.

The rehabilitation program provided to older adults post COVID-19 includes: Neuromotor rehabilitation which applying passive mobilization, active exercises, and postures to regain or maintain joint range of motion. Respiratory rehabilitation such as breathing exercises and lung secretion clearance, and neuropsychological rehabilitation which proposed after assessment to patients with cognitive disorders, related to hypoxic encephalopathy due to coronavirus (stroke, etc.), also elderly people who have lost their autonomy and have difficulty carrying out daily living activities may benefit from occupational therapy. **(HAS, 2020).**

In older adult patients (>65 years) with comorbidities, post-COVID-19 issues and long-term complications such lung fibrosis and restricted respiratory muscles dysfunction have been seen most frequently. In addition to any physical issues, patients' social, psychological, and quality of life have all suffered as a result of COVID-19. (**Chen et al., 2020 &Gourna et al., 2020).** The rise in depression, anxiety, post-traumatic stress disorder (PTSD), and substance use disorders is concerning. (**Del Rio et al., 2020).**

All COVID-19 hospitalized patients, especially older adults, are physically weak to some extent. They are weaker than they were prior to the illness (**Vaes et al., 2020**). This could be the result of merely spending more time in bed than normal. However, patients receiving ICU-level care may experience ICU-related weakness, which can harm the body's nerves and muscles. These patients may struggle to move and perform daily tasks like getting dressed and taking a shower because of weakness in their hands, fingers, or lower legs **(Urban 2020).**

Significant of the study

According to the report of **Worldometer Egypt (2020)**, with an estimated 103 million people, Egypt is the most populous nation in the Middle East, with 21 million of them living in Cairo, the capital. In Cairo, there were 211 307 confirmed COVID-19 cases, 159 999 of which had completed their recovery by 2021. (**World population review. Cairo population 2021).**

In Egypt over 12 thousand COVID-19 deaths and over 207 thousand confirmed cases were reported in 2020. According to the Egyptian Ministry of Health (MOHP), although those 60 and older make up 6.7% of the population overall, they are responsible for 20% and 7%, respectively, of COVID-19 infections in people aged over 60 and 70. Furthermore, older patients represent 60% of all deaths **(MOHP 2020).**

Tele-rehabilitation is useful for patients with musculoskeletal problems, multiple sclerosis, osteoarthritis, and the restoration of motor function, according to several systematic reviews. **(Yeroushalmi et al., 2019).** Tele-rehabilitation can also lower health care costs, increase older adult patients' compliance with treatment, enhance physical, psychosocial function, and quality of life, furthermore, be provided in a way that is acceptable to patients. **(Prvu Bettger et al., 2020).**

Telehealth may be necessary for the general public, medical professionals, and COVID-19 patients during a quarantine to enable patients to speak with a clinician about their medical concerns and receive proper care in real time, also to reduce over burden on health services. Consequently, this study's purpose was to evaluate the effectiveness of tele-rehabilitation program for older adults post COVID-19.

Study Aim

The study aimed to evaluate the effectiveness of tele-rehabilitation program for older adults post COVID-19.

Study hypothesis

The tele-rehabilitation program for older adults post COVID-19 will optimize functioning, independence**,** and maximize quality of life, further, to relieve anxiety and depression.

Subjects and Methods

Research design:

A Quasi-experimental research design was utilized in order to evaluate the effectiveness of tele-rehabilitation program for elderly post COVID-19.

1-Technical Design:

Research Setting:

The study sample was selected from Ain Shams University Specialized Hospital El Obour, Egypt. The major hospital in Egypt provided treatment for COVID- 19 cases, and it is also one of the largest hospitals, which capacity more than 100 patients, and has intensive care units that accommodate more than 40 patients.

Sample:

A purposive sample used for conducting this study, the total number of older adults survived were 1189 cases, the study sample were (112) plus (12) for pilot study of older adults post COVID- 19 according to sample size equation have a confidence level of 95% that the real value is within ±5% of the measured/surveyed value. The study sample selected from discharged patients from the previously mentioned hospital from first July to the end of August ,2020 with the following criteria:

The inclusion Criteria is as follows: All older adults aged more than 60 years, diagnosed with COVID, and discharged from hospital. Also, who can use the smart phone or computer, fluent in using the internet and communicating on social media.

The exclusion Criteria is as follows: Those who have physical or mental disability or are in coma or unconscious.

Data collection tool:

Post reviewing the textbooks and recent research, Self-reported electronic questionnaire was designed in Arabic language to collect data through Microsoft form questionnaire which developed by the researchers and consisted of six parts as follow:

Part I: This part assesses demographic data of the study sample of older adults. Which consisted of seven close-ended questions i.e, age, gender, marital status, educational level, residence, number of family members, number of home rooms, and family income. Then make the crowding index as the result of number of family members versus number of rooms).

$$The\ crowding index = \frac{\text{Number of family members}}{\text{Number of rooms}}.$$

Scoring of crowding indexes was categorized into three level as follow: Not crowded <= 1.0 person per room, Crowded >1.0<=1.5 people per room, and severely crowded >1.5 people per room. The Family Crowding Index (F.C.I) formula was adopted from **Torshizian and Grimes (2020).**

Part II: Medical history of the studied sample. This part was composed of seven close-ended questions that include current health history such as (smoking, general weakness, fatigue, dry cough, productive cough, breathlessness, reduced attention and concentration, and comorbidity).

Part III: Activities of daily living scale (ADL & IADL). This part was composed of 2 sections adopted from **Naghdi et al., (2016).**

Section I- Activities of Daily Living (ADL) assessment format which is composed of ten close-ended questions. It covers mobility, transferring, bathing, dressing, toileting, continence, feeding, stairs, exercises, and grooming.

Section 2- instrumental activities of daily living (IAD) assessment format is composed of eight close-ended questions. It covers telephoning, shopping, medicating, handling money, preparing food, housekeeping, laundry, and transporting.

Scoring system for ADL

The score ranged between (0-1-2) for every point, which is composed of three items for every point, so in the first assessment tool, it contains ten points by score (2) for independent performance, score (1) fore needing assistance in performance and score (0) for total dependent performance. The total score is categorized as follow:

ADLs score (0-20): 0 -7 = Dependent, 8 - 12= Assisted (independent with assistant), and 13 -20 =Independent.

IADLs score (0-16): 0 - 6 = dependent, 7 - 10=Assisted (independent with assistant), and 11 - 16 =Independent.

Part IV: Older People's Quality of Life Questionnaire (OPQOL). An instrument

developed by **Bowling, and Stenner, (2011).** To measure individuals' QOL. It consisted of 35 items QoL measure. Within eight subscales representing: life overall (4 items), health (4 items), social relationships and participation (8 items), independence, control over life, freedom (5 items), area: home and neighborhood (4 items), psychological and emotional wellbeing (4items), financial circumstances (4 items), religion/culture (2 items).

Scoring system of QoL:

The instrument has Likert scales for 5-point from strongly agree to strongly disagree, Items are scored (with reverse coding of positive responses, so that higher scores equal higher QoL; the scale ranges are 35 (QoL so bad could not be worse) to 175 (QoL so good could not be better). The total scale categorized to three levels as: Poor QoL= 35:58, Moderate QoL = 59: 116, and Good QoL= 117:175.

Part V: The Zung Self-Rating Depression Scale (SDS) and Zung Self-Rating Anxiety Scale (SAS) which adopted from **Dunstan et al., (2017).**

The SDS consists of 20-item Likert scale which was rated by respondents according to how each applied to them within the past week, using a 4-point scale ranging from 1(none, or a little of the time) to 4 (most, or all of the time). (https://wia.unl.edu/documents/2017/zung-self-rating-depression-scale).

The SAS also devised a similar 20-item scale to screen for the presence of clinical anxiety: Likert scale ranging from 1 to 4 points. Most answers go in the order of 1 (a little of the time) to 4 (most of the time). However, questions 5, 9, 13, 17, and 19 are scored in the opposite order since they represent positive/non-anxiety statements. (https:// loricalabresemd. com/ wpcontent/ uploads/ 2017/ 12/ zung-anxiety-scale.pdf).

Scoring system: Scores are then calculated according to **Dunstan, and Scott, (2020)**, and individuals are given the following results: (**Timonen et al., 2019).**

Total Rate Scale	SDS	SAS
Nil/ Minimum	25 to 49	20-44
Mild	50–59	45-59
Moderate	60–69	60-74
Severe	70+	75-80

Part VI: Reported practices to assess older adults' practices toward rehabilitative care of post COVID-19 condition which consisted of three sections 30 items.

Section I (15 items): Improve pulmonary functions such as, proper positions to relieve breathlessness e.g., (high side lying, forward lean setting, forward lean setting without table in front, forward lean standing, standing with back support), increasing ventilation through active cycle of breathing techniques (ACBT) e.g., (relax, inhale, hold, exhale, hold), air way clearance e.g., (deep breathing with thoracic expansion, exhaling with a huff with an open mouth, deep breaths (x3), 1-2 huffs).

Section II (10 items): Prevention of physical deconditioning and muscle weakness such as muscle stretching & strengthening exercises e.g., (bicep curl, wall push-up, abduction, the 30-second sit-to-stand test (30STS), the 6-minute walk test (6MWT), knee straightening, heel raisers), physical exercises & fitness such as (walking, marching on the spot, and step-ups).

Section III (5 items): Infection control considerations at home such as (hand hygiene, respiratory hygiene, environmental cleaning, use of personal protective equipment (PPE), and waste management).

Scoring system:

The total practices items score ranged from zero to "1", for each item. So, each item done takes one mark and zero if not done then so, scores were summed-up and the total marks converted into percent score which classified into adequate if the percent score was 60% or more and inadequate if less than 60%. The total scores ranged from zero to 25 which classified into "not done" if the score was ranged from 0: 15 and "Done" if ranged from 16: 25.

Validity and reliability

Validity:

The tool of the study was given to a group of three experts in the nursing Community field, Faculty of Nursing, and two professors of Geriatrics Faculty of Medicine, Ain Shams University. The researchers looked at the tool's content coverage, clarity, application, relevancy, phrasing, length, format, and overall presentation. Modifications have been done on a minor basis based on advice from specialists.

Reliability:

All of the survey items generated by researchers have excellent to very good internal consistency as measured by the Cronbach's alpha coefficient (0.70 to 0.96) and outstanding inter-rater reliability (ICC: 0.88-0.98). All standard items of QoL, ADL, IADL, SDS, and SAS were already done, and no modifications added. (**Naghdi et al., 2016)**.

II. Operational Design:

Pilot study:

A pilot study was carried out on 12 older adults' patients after COVID survivors which represent 10% of the total sample which estimated before conducting the actual study, to test the feasibility, clarity, and applicability of the study tool also to test availability and accessibility of tele-health method and effectiveness of group chats to calculate the time needed to conduct each tool through the Microsoft Form application. Some modifications were carried out on the tool, so the sample of pilot study was excluded from the total study sample.

Administration Design:

Administrators of Ain Shams University Specialized Hospital El Obour had been given official approval to conduct the study through the issuance of a letter from the Dean of the Faculty of Nursing at Ain Shams University.

Fieldwork:

- An official permission to conduct the study was obtained from the directors of Specialized Hospital El Obour. The researchers explained to the patients their ethical rights and got their consent.
- Data were collected over a period of three months from first August to the end of, October 2020. Each patient was interviewed individually through social media once to have approval of participation in study and collect the data before implementing the intervention program for 2 weeks. and then enrolled them in group through ZOOM Application in order to conduct the program through 6 sessions for 6 weeks long consecutive during implementation and after finishing the intervention program link of evaluation tool was sent to all participants on their own WhatsApp.

The Present study was conducting in four phases:

I. Preparatory phase:

A review of recent current national and international related literature in various aspects of the COVID-19 was applied at this phase to design the study tool

II. Assessment phase

It included interviewing assessment through ZOOM meeting to assess the demographic characteristics, health history, and patients' level of ADL, IADL, QoL, SDS, and SAS, also rehabilitative care practices by using of assessment tool through one month from 3: 4 patients daily.

III. Planning and implementation phase

A plan was formulated for older adults' patients based on assessment phase and literature review, the researchers prepared the ZOOM meeting for training schedule, teaching aids and media (PowerPoint presentation, and videos about physical exercise steps preventive measures of COVID. The researchers enrolled each 18: 19 older adult patients post COVID in a group to attend the training once every week for 6 weeks; the researchers conducted program twice per day for 3 days weekly.

The general objective of tele-rehabilitation program for post COVID patients:

The older adults will be able to perform the breathing exercise technique to improve their respiratory function and strength their muscles and enhance their level of independence which lead to maximize their quality of life and relieve depression and anxiety level.

The content of tele-rehabilitation program:

- ***Session 1:***
  - Discuss the specific rehabilitation needs after discharge
  - Apply the breathing exercises to strength diaphragm muscles and chest wall muscles.
- ***Session II:***
  - Increase ventilation through active cycle of breathing techniques (ACBT) e.g., (relax, inhale, hold, exhale, hold).
  - Demonstrate the air way clearance e.g., (deep breathing with thoracic expansion, exhaling with a huff with an open mouth, deep breaths (x3), 1-2 huffs).
- ***Session III:***
  - Identify the proper positions to relieve breathlessness e.g., (high side lying, forward lean setting, forward lean setting without table in front, forward lean standing, standing with back support).
- ***Session IV:***
  - Prevent the physical deconditioning and muscle weakness
  - Apply muscle stretching & strengthening exercises e.g., (bicep curl, wall push-up, abduction, the 30-second sit-to-stand test (30STS), the six-minute walk test (6MWT), knee straightening, heel raisers)
  - Conduct physical exercises & fitness such as (walking, marching the spot, and step-ups).
- ***Session V:***
  - Engage in regular communication for social purposes.
  - Use phones, video calls, or social media to engage with family and friends.
  - Eating a healthy diet improves the immunity system.
  - Engage in the exercises outlined in this packet.
  - Getting good sleep will improve the outlook and feelings of wellbeing.
- ***Session VI:***
  - Maintain infection control considerations at home such as (hand hygiene, respiratory hygiene, environmental cleaning, use of PPE, and waste management).

IV. Evaluation phase

Using the same pre-program tools to evaluate the tele-rehabilitation program's impact on older adults' health regarding their level of function, independence, QoL, depression, and anxiety by sending the link of evaluation form to patients through WhatsApp and collected the data in two weeks.

Ethical Consideration:

Approval was taken from the ethical committee at the Faculty of Nursing, Ain Shames University. Written consent had been obtained from the older adult patients post COVID. Confidentiality of data was given as an assurance that the personal data was never published. Participants had been informed verbally about their right to withdraw from the study at any time if they like.

Statistical Design:

The SPSS program version (23) was used to review, code, analysis, and tabulate the data using the number and percentage distribution. ANOVA was used for the analysis of variance. To evaluate the association between variables, qualitative data are provided as numbers and percentages and are then subjected to a chi-square test, and Pearson's correlation test Relevance of the findings: $P < 0.05$ indicates significant (S), $P > 0.05$ indicates non-significant (NS). $P < 0.001$ qualifies as highly significant (HS).

Results:

Table (1) shows that the age of 41.1% of the studied sample ranged between 65: < 70 years and 24.1% of them were between 70: < 75, with mean ± SD of 69.72 ± 7.99. Also, 40.2% of them are males, compared to 59.8% females. It also indicated that 59.8% of the elderly participants are married, while 20.5%of them were widows / widowers. With regard to the educational level, it was found that 51.8% have finished their secondary education, 18.8% have completed their primary education, 81.2% lived in urban areas and crowded houses of

50.9% of them with insufficient income of 80.4%.

Figure (1) illustrates that most participants of older adults (93.8%) suffered of comorbidity like diabetes and cardiovascular diseases, majority of them (87.5%) suffered of breathlessness and more than half of them complained of fatigue, productive cough, and general weakness (62.5%, 59.8%, and 50.9% respectively.

Table (2) presents that half of older adults' patients post COVID-19 (50.9%) were dependent when practiced their ADL preprogram intervention while, post program, they improved to 53.6% became independents with significant statistical relation with p value < 0.001. Also reveals that 46.4% of patients suffered from dependent IADL preprogram and significantly improved to 67% post program.

Table (3) proved that there was significantly improvement in total QoL level of older adults post COVID-19 from poor level preprogram to good level post program of 63.4%, and 55.4% respectively with χ^2 = 40.2672 and p value is < 0.001.

Table (4) demonstrates that there were significant improvements in the level of depression among post COVID patients after the rehabilitation program, where 18.8% of patients suffered from severe depression according to self-rating depression scale (SDS) preprogram and became only 5.4% post the program. In addition to improvement of the level of anxiety, 22.3% of patients suffered severe anxiety according to self-rating anxiety scale preprogram to become 7.1% post program intervention with p value < 0.001.

Table (5) reveals that the majority of post COVID older adults improved their practices about proper positions to relieve breathlessness, ACBT, and air way clearance exercise post rehabilitative program, for 87.5%, 80.4%, and 81.3% of them respectively with p value < .001. Also, there was improvement of performing of muscle stretching & strengthening exercises, physical exercises, and fitness post program intervention to 75.9% and 72.3% respectively. Furthermore, significant improvement of infection control considerations posts program intervention.

Figure (2) illustrates that the total rehabilitative care practices were done post program intervention by 77.7% of post COVID older adult patients compared with 18.8% preprogram.

Table (6) proved that there was positive correlation between rehabilitative care practices post COVID-19 and ADL, AIDL, and QoL with p value < .001. While negative correlation between rehabilitative care and SDS and SAS with p value < .001.

Table (7) proved that there was insignificant relation between older adults' patients' post COVID-19 rehabilitative care and their socio-demographic characteristics variables except to marital status preprogram and family income post program with χ^2 (P value) = 11.4309(.00961) and 4.3217 (.037629) respectively.

Table (1): Distribution of older adults' patients post COVID-19 according to their socio-demographic characteristics (no. =112).

Demographic characteristics	No	%
Age		
60: <65	24	21.4
65: < 70	46	41.1
70: < 75	27	24.1
75: ≤ 80	15	13.4
Gender		
Male	45	40.2
Female	67	59.8
Marital status		
Single	9	8.0
Married	67	59.8
Widow/ widower	23	20.5
Divorced	13	11.6
Educational level		
Read& write	10	8.9
Primary	21	18.8
Secondary	58	51.8
University	23	20.5
Residence		
Rural	21	18.8
Urban	91	81.2
Family income		
Sufficient	22	19.6
Insufficient	90	80.4
Crowding index		
Not crowded	34	30.4
Crowded	57	50.9
Overcrowded	21	18.7

Figure (1): Distribution of older adults' patients post COVID-19 according to their medical history (no.=112).

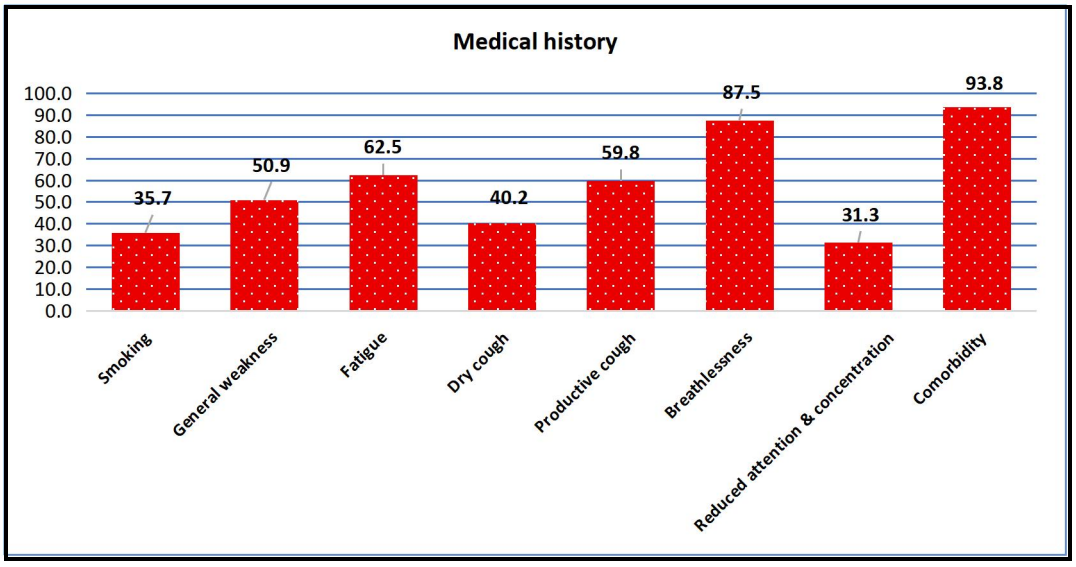

Table (2): Distribution of older adults' patients post COVID-19 according to their Activities of daily living (ADL) and instrumental activities of daily living (IADL) pre and post rehabilitation program (no.=112).

Items	Preprogram		Post program		Statistical test	
ADL	**No**	**%**	**No**	**%**	χ^2	**P value**
Dependent	57	50.9	31	27.7	32.4861	< 0.00001*
Assisted	43	38.4	21	18.8		
Independent	22	19.6	60	53.6		
IADL					33.084	< 0.00001*
Dependent	52	46.4	24	21.4		
Assisted	28	25.0	13	11.6		
Independent	32	28.6	75	67.0		

Table (3): Distribution of older adults' patients post COVID-19 according to their QoL level pre and post rehabilitation program (no.=112).

Items	Preprogram		Post program		Statistical test	
Total QoL	**No**	**%**	**No**	**%**	χ^2	**P value**
Poor	71	63.4	31	27.7	40.2672	< 0.00001*
Moderate	23	20.5	19	17.0		
Good	18	16.1	62	55.4		

Table (4): Distribution of older adults' patients post COVID-19 according to their Depression level (SDS) and Anxiety level (SAS) pre and post rehabilitation program (no.=112).

Items	Preprogram		Post program		Statistical test	
	No	**%**	**No**	**%**	χ^2	**P value**
SDS					46.3833.	< 0.00001*
Nil/ Minimum	17	15.2	53	47.3		
Mild	26	23.2	38	33.9		
Moderate	48	42.9	15	13.4		
Severe	21	18.8	6	5.4		
SAS					41.2647.	< 0.00001*
Nil/ Minimum	19	17.0	62	55.4		
Mild	26	23.2	24	21.4		
Moderate	42	37.5	18	16.1		
Severe	25	22.3	8	7.1		

Table (5): Distribution of older adults' patients post COVID-19 according to their rehabilitative care practices pre and post rehabilitation program (no.=112).

Rehabilitative care practices	Preprogram				Post program				Statistical test
	Done		Not done		Done		Not done		
	N0	**%**	**No**	**%**	**N0**	**%**	**No**	**%**	
Improve pulmonary functions									
Proper positions to relieve breathlessness	12	10.7	100	89.3	98	87.5	14	12.5	104.3406 **< .00001**
Increasing ventilation through active cycle of breathing techniques (ACBT)	14	12.5	98	87.5	90	80.4	22	19.6	79.8481 **< .00001**
Air way clearance	17	15.2	95	84.8	91	81.3	21	18.8	71.1529 **< .00001**
Prevention of physical deconditioning and muscle weakness									
Muscle stretching & strengthening exercises	20	17.9	92	82.1	85	75.9	27	24.1	75.7423 **< .00001**
Physical exercises & fitness	19	17.0	93	83.0	81	72.3	31	27.7	69.44 **< .00001**
Infection control considerations	30	26.8	82	73.2	99	88.4	13	11.6	87.0228 **< .00001**

Figure (2): Distribution of older adults' patients post COVID-19 according to their total rehabilitative care practices pre and post rehabilitation program (no.=112).

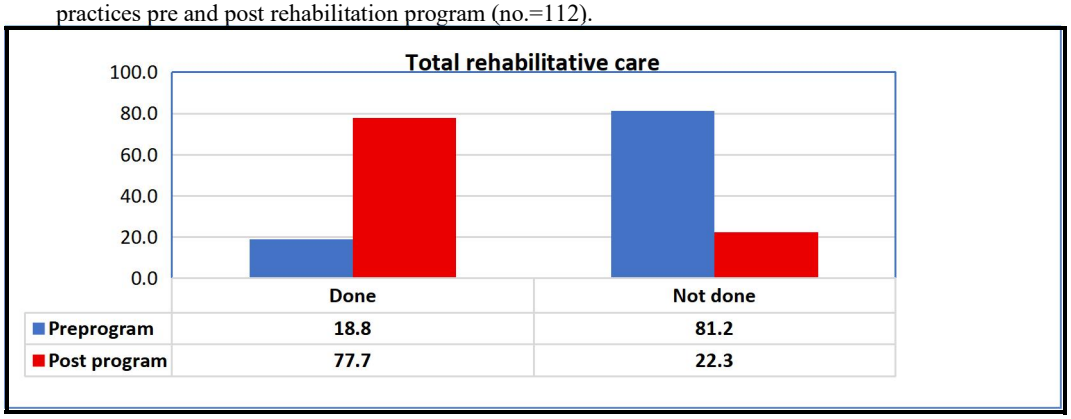

Table (6): The correlation between older adults' patients' post COVID-19 rehabilitative care and their level of ADL, IADL, QoL, SDS, and SAS through pre and post rehabilitation program (no.=112).

Items	Rehabilitative care practices post COVID-19			
	Preprogram		Post program	
	r	P value	r	P value
ADL	0.8165	< .00001*	0.4918	< .00001*
AIDL	0.6782	< .00001*	0.9064	< .00001*
QoL	0.6309	< .00001*	0.9885.	< .00001*
SDS	-0.9533	< .00001*	-0.987	< .00001*
SAS	-0.9784	< .00001*	-0.9719	< .00001*

Table (7): The relation between older adults' patients' post COVID-19 rehabilitative care and their socio-demographic characteristics (no.=112).

Demographic characteristics	Preprogram				Post program			
	Done		Not done		Done		Not done	
	No	%	No	%	No	%	No	%
Age								
60: <65	5	4.5	19	17.0	17	15.2	7	6.3
65: < 70	8	7.1	38	33.9	36	32.1	10	8.9
70: < 75	5	4.5	22	19.6	20	17.9	7	6.3
75: ≤ 80	6	5.4	9	8.0	10	8.9	5	4.5
χ^2 (P value)	3.6589 **(.30073)**				0.9804 **(.805983)**			
Gender								
Male	9	8.0	36	32.1	30	26.8	15	13.4
Female	10	8.9	57	50.9	44	39.3	23	20.5
χ^2 (P value)	0.4921 **(.48298)**				0.0119**(.913172)**			
Marital status								
Single	4	3.6	5	4.5	6	5.4	3	2.7
Married	18	16.1	49	43.8	57	50.9	10	8.9
Widow/ widower	6	5.4	17	15.2	19	17.0	4	3.6
Divorced	4	3.6	9	8.0	8	7.1	5	4.5
χ^2 (P value)	11.4309**(.00961) ***				5.0039 **(.171512)**			
Educational level								
Read& write	4	3.6	6	5.4	7	6.3	3	2.7
Primary	6	5.4	15	13.4	13	11.6	8	7.1
Secondary	8	7.1	50	44.6	47	42.0	11	9.8
University	6	5.4	17	15.2	16	14.3	7	6.3
χ^2 (P value)	4.9897 **(.172557)**				3.4152 **(.331923)**			
Residence								
Rural	5	4.5	16	14.3	15	13.4	6	5.4
Urban	21	18.8	70	62.5	69	61.6	22	19.6
χ^2 (P value)	0.0051 **(.94286)**				0.1758 **(.674987)**			
Family income								
Sufficient	6		16		12		10	
Insufficient	12		78		69		21	
χ^2 (P value)	2.5467 **(.110528)**				4.3217 **(.037629) ***			
Crowding index								
Not crowded	9		25		22		12	
Crowded	17		40		37		20	
Overcrowded	5		16		15		6	
χ^2 (P value)	0.313 **(.855147)**				0.3313 **(.847345)**			

Discussion

It is evident that older individuals are particularly impacted by COVID-19; also, they are the group most likely to require hospital admission and to die from COVID-19 infection. Frail and multimorbid individuals, who are more likely to be older, are also likely to be more severely impacted. Therefore, rehabilitation techniques must be able to provide rehabilitation to patients with a high burden of pre-existing vulnerability and disease in addition to the wide variety of impairments induced by COVID-19 illness (**Onder et al., 2020)**.

The need for tele-rehabilitation has lately grown in many chronic conditions due to the wide availability of new technology and the unmet needs caused by the COVID-19 pandemic's lockdown and restrictions **(Zasadzka et al., 2021).** Telehealth, or the delivery of health care digitally and remotely, has become common place in many countries in response to the disruption of health care services as a result of hospitals being filled with Covid patients, as the elderly are the most vulnerable to infection. So, it became imperative for them to stay away from hospitals, most of which have been turned into isolation. Therefore, this transformation had positive effects on the elderly in a significant improvement in their conditions **(Liu et al., 2020 & Carfì et al., 2020).**

The study conducted on 112 older adult patients post COVID-19 after discharged from hospital and revealed that the 41.1% of them their age ranged between 65: < 70 years and 24.1% of them were between 70: < 75, with mean ± SD of 69.72 ± 7.99. Also, 40.2% of them are males, compared to 59.8% females.

The current study illustrated that most participants of older adults post COVID-19 suffered of comorbidity like diabetes and cardiovascular diseases, majority of them suffered of breathlessness and more than half of them complained of fatigue, productive cough, and general weakness. These findings are similar with **Carfì et al., (2020) & Salini et al., (2020)** who found that in their study more than 50% experienced persistent fatigue, 43% suffered from dyspnea and 27% experienced joint pain. The rate of these symptoms is higher among older people.

Also, the results agree with **Qu, et al., (2020)** who conduct their study on 581 post COVID patients after discharge and found that A total of 311 patients (57.6%) had one or more distressing physical symptoms, according to reports. The most frequent complaint reported by COVID-19 patients who were released was fatigue (29.4%), followed by shortness of breath after modest exercise (26.1%) and joint discomfort (24.3%).

Likewise, agreement with **Emami et al., (2020)** who reported that the hospitalized COVID-19 patients often have comorbidities, such as cardiovascular disease and diabetes, which lead to prolonged hospital stays. Some COVID-19 survivors suffer physical impairments, such as muscle weakness, fatigue, neurological impairment, and/or dietary disturbances, which may be aggravated by extended immobilization. (**Wang et al., 2020 & Kiekens et al., 2020**).

The present study revealed that half of older adults' patients post COVID-19 were dependent when performing their ADL and IADL preprogram while significantly improved post program intervention with χ^2 = 32.4861, and 33.084 respectively, p value < 0.001. This is congruent to study by **Pizarro et al., (2021)** who concluded that in their study, after the acute phase of infection, patients with COVID-19 showed a critical decrease of functional capacity in ADL performance, suggesting a loss of independence. All included investigations indicated a drop in ADL that went beyond the test or scale utilized.

Also similar to a study by **Wade (2020),** who reported that the patient is having (new or more severe) physical or psychological problems, as well as any other issues in daily life that concern them. These issues include any new problems or symptoms that have resulted from the COVID-19 infection, their ability to perform ADL and IADL actions at the level they expect, and any other issues in daily life.

This is due to their muscle weakness due to their aging changes and long stay in the hospital for a period longer than a week, so

they were unable to perform the activities of daily living independently.

The current study explored that there was significantly improvement in total QoL level of older adults post COVID-19 from poor level preprogram to good level post program of 63.4%, and 55.4% respectively. These findings were consistent with different studies by **Santus et al., (2020)** and **Van der et al., (2020**), who proved that in their study; patients reported significant improvements in health related Quality of life and dyspnea at rest and during daily activities 15 days after leaving the hospital.

Also, these findings were agreement with study by **Bordne et al., (2020),** who conduct their study on older adults in Germany and found that in this study, during the rehabilitation stay, both outcomes-physical functionality and psychological well-being, or appreciation of life, representing a subjective method of assessing quality of life- improved.

Significant consequences, notably with regard to physical, mental, social, and spiritual health, have been found in studies on the COVID-19 pandemic's impact on the general populations of Saudi Arabia, Lebanon, Italy, the United Kingdom, the United States, Morocco, and China. (**Ma et al., 2020 & Zhang, and Ma., 2020).**

The current study result demonstrates that there was a significant improvement in the level of depression and anxiety level among post COVID older adults' patients after the rehabilitation program, which measured by using self-rating depression scale (SDS) and self-rating anxiety scale (SAS)with p value < 0.001.These findings were consistent with a study by **Liu[a] et al., (2020),** who stated that in order to evaluate the patients' degrees of anxiety and depression, the self-rating depression scale (SDS) and the self-rating anxiety scale (SAS) were utilized. Given that the baseline characteristics of the two groups were similar, the SAS score in the experiment group was found to be significantly lower than that in the control group at 6 weeks from baseline (47.4 6.3 vs. 54.9 7.3; p 0.05), and the decrease of SAS score within the experiment group at 6 weeks from baseline (56.3 8.1 vs. 47.4 6.3; p 0.05). But contradicted by their study about SDS. At 6 weeks following baseline, the SDS scores across the two groups did not differ substantially ($p > 0.05$).

From the researchers' point of view, this contradiction exists because in other countries, laws were strictly applied to maintain precautionary measures and social distancing during the COVID pandemic, which deprived these elderly people of social activities, even seeing their children and grandchildren, which led to their feeling of isolation and unhappy which lead to increase their depression level.

Finding of this study revealed that the majority of post COVID older adults improved their practices about proper positions to relieve breathlessness, ACBT, and air way clearance exercise post rehabilitative program. This outcome was corroborated in a study by **Shokry Abd-Allah & Elsayed Elshora (2021)**, who said that 98.3% of the tested sample was unable to manage diaphragmatic breathing method, and 96.7% of them were unable to accomplish pursed lip breathing.

According to **Zhao et al., (2020),** who decided that the goal of pulmonary rehabilitation was to restore physical functions and quality of life by using breathing strategies to treat dyspnea, anxiety, and depressive symptoms. Also, **Zhu et al., (2020)** recommended that additionally, spontaneous deep breathing and early mobilization maximize the power of the respiratory and diaphragmatic muscles and aid in the recovery of respiratory function. These actions also limit the discharge of pulmonary secretions and, as a result, the risk of lung infection.

The present results explained that there was improvement of performing of muscle stretching and strengthening exercises, such as (bicep curl, wall push-up, abduction, sit-to-stand, knee straightening, squats, heel raisers), and physical exercises & fitness such as (walking, marching on the spot, and step-ups), post program intervention to majority of older adults' participants.

These results are conformed with the findings of the study by **Laurine et al., (2020),** who said that the most often used tests applied to assess exercise capacity in the included studies were the 30-second sit-to-stand test

(30STS) and the six-minute walk test (6MWT). The findings showed a notable improvement in favor of the rehabilitation group.

Also consistent with the outcome of study by **Aline et al., (2021),** who reported that the functional independence measure (FIM) significantly improved both before and after receiving patient rehabilitation care (p 0.0001). Walking ability and muscle strength both improved significantly (p 0.01). Improvements in FIM scores (Spearman's r=0.71) and gains in lean mass (Spearman's r=0.79) were the most significant variables associated with the time of rehabilitation treatment.

In addition, the current study cleared that there was significant improvement of infection control considerations post program intervention. From the researchers' point of view, the elderly patients, after a severe experience of Covid infection and their exposure to hospitalization or sometimes intensive care, made them more keen to follow all precautionary measures accurately so that such a crisis would not recur.

The current study proved that there was positive correlation between rehabilitative care practices post COVID-19 and ADL, AIDL, and QoL with p value < .001. While negative correlation between rehabilitative care and SDS and SAS with p value < .001. This finding is similar with the Respiratory Rehabilitation Committee of CARM, and Cardiopulmonary rehabilitation Group of CSPMR suggest that, apart from easing respiratory distress, improving physical function, and QoL, pulmonary rehabilitation programs can be useful in improving both anxiety and depression **(Chinese Association of Rehabilitation Medicine, 2020).**

Also congruent with **Liu[b] et al., (2020):** who said that the six-week respiratory rehabilitation program was carried out in 72 Chinese patients who had recovered from COVID-19. It can improve respiratory function, quality of life, and anxiety in elderly COVID-19 patients, but it has only marginally significant improvements in depression in the elderly (p0.05) when compared to the control group.

Findings of this study proved that there was insignificant relation between older adults' patients' post COVID-19 rehabilitative care and their socio-demographic characteristics variables except to marital status preprogram and family income post program with χ^2 (P value) = 11.4309 (.00961) and 4.3217 (.037629) respectively.

These results are due to the fact that the group participating in the study is characterized by the same social characteristics and they have the same needs and requirements, where they are all elderly. But in the case of marriage, it is possible that this is due to one of the spouses who was caring for the other or one of the children helping them, for example. As for the income situation, the difference was noticed as a result that the highest income is the ability to comply well with the program.

The tele-rehabilitation program was effective to older patients post COVID where they cannot reach the rehabilitation services centers in condition of COVID pandemics, so it is become accessible to use telehealth and send videos through social media and group chats to them in their homes. And this opinion was agreed with **McNeary et al., (2020),** who said thatCOVID-19 older adults' patients in isolation may benefit from pulmonary rehabilitation through educational videos, instruction manuals, or telehealth.

Conclusion

The study proved that there was positive correlation between rehabilitative care practices post COVID-19 and ADL, AIDL, and QoL with p value < .001. While negative correlation between rehabilitative care and SDS and SAS with p value < .001.

The tele rehabilitation program for elderly post COVID-19 was effective to optimize functioning of ADL and IADL, which lead to improve independence level, and maximize quality of life, further, to relieve anxiety and depression.

Recommendations

The results of this study recommended that:

1. Continuous rehabilitation programs for post COVID older adult patients should be

applied in another isolation hospitals periodically in order to improve recovery from COVID and optimize the QoL for those patients.

2. Provide the tele-rehabilitation program for community-based care services to increase the public awareness about breathing exercises, physical exercise, and psychological support which could promote health status for older adult patients post COVID.
3. Further research to identify obstacles that have been associated with applications of tele-communication technology, more home-based programs, and enhancing the resilience of older adults to cope with stresses of COVID-19.
4. Further research is recommended to identify the support that will help older adults self-management to prevent recurrent infection with COVID.

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