- *Basic Research*

Prevalence of Functional Health Limitation among Post Graduate Students with Post-Covid-19 Syndrome: Instructional Module

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Abstract

Background: Since the starting of coronavirus disease 2019 pandemic broke out, post-covid-19 survivors have received the majority of attention. globally, due to the association of high mortality rate and the presence of post-covid-19 syndromes with varying degrees of prolonged impairment of pulmonary function, muscle weakness, discomfort, exhaustion, depression, work-related issues, and a decreased quality of life. **Aim:** The study aims to assess the prevalence of functional health limitations among postgraduate students with post-covid-19 syndromes. **Design:** Longitudinal cohort; quasi-experimental retrospectively data collected from postgraduate students with post-covid-19 syndromes. **Setting:** Faculty of Nursing, Helwan University/Egypt **Subjects:** A purposive sample of 65 postgraduate students who were previously infected. **Tools:** (1) Post-covid-19 syndrome follow-up screening questionnaire, (2) Post-covid-19 functional status scale, and (3) Post-covid-19 rehabilitation screening. **Results:** 52.3% of studied students severely suffered from post-covid-19 diagnosis and mildly require constant care with (44.6% & 80.0%) of them forced to avoid needed duties/activities and experiencing functional health limitations post-covid-19 trauma. **Conclusion:** There was an improvement in the most of studied student covid-19 rehabilitation screening scale with a highly significant correlation between ages, gender, hospital workplace, and total post-covid-19 functional status scale with a significant correlation between experience years' experience, educational level, and length of hospital stay after instructional module carrying out. **Recommendations:** Establish a team approach to monitoring patients' post-covid-19, raising clinical awareness and home self-monitoring for preventing functional health limitations, and enhancing results.

Key words: postgraduate students, instructional module, functional health limitation, post-

covid-19 Syndrome

Introduction

The coronavirus disease 2019 (Covid-19) had been designated as a global epidemic by the World Health Organization (WHO) in n January 2020. Many other pulmonary and extra pulmonary symptoms have been recorded. A significant fraction of these patients have been documented to have post-corona virus chronic symptoms that progressed to low functional status. Covid-19 infections have been linked to acute respiratory distress syndrome, extended hospital stays, and admission to an intensive care unit (**Davis et al., 2023).**

Commonly, post-covid-19 syndrome identified as long covid which affect anyone exposed to SARS-CoV-2, regardless of age or severity of original warning sign. As long as the symptoms have persisted for at least two months without a known cause, it is considered to have occurred three months after the original SARS-CoV-2 infection. Over 200 distinct symptoms that can cause daily functioning limitation, exhaustion, shortness of breath, and cognitive dysfunction which are prominent signs of chronic covid had been described **(World Health Organization, 2022).**

Post-covid-19 symptoms take account of neuromusculoskeletal disorders and functional limitations which include cardiovascular consequences, dyspnea may lead to severe hypoxemia, anxiety, and/or depression, along with neuropathy and muscle weakness. Therefore, these functional limitations must be researched after discharge and during the early rehabilitation phases throughout the convalescence to prevent deterioration **(Martillo et al., 2021).**

Disseminated intravascular coagulation (DIC) has been documented to develop in individuals with the most severe form of the coronavirus disease, increasing the reliable mortality indicator **(Asakura & Ogawa, 2022).** DIC occurs as a consequence of an acute inflammatory response or sepsis, which leads to endothelial and tissue damage and, ultimately, to multiple organ failure. Thus, the identification of patients with coagulopathy is of paramount importance to determine if anticoagulant therapy should be started to improve prognosis **(Beraldo, 2020 and Tang, 2020).**

Pain, sleep quality, nutritional status, mood, and the necessity of returning to work with whole functional status, in the midst of other aspects, would be beneficial for post-covid-19 patients' functional rehabilitation and maybe change how well patients perform throughout therapy treatments. These must be evaluated in light of each person's unique demands **(Pancera, 2020).**

The nutritional state of the patient is crucial to monitor during a Covid-19 infection since it has a direct impact on the patient's health and prognosis. Therefore, the early and prevalent manifestations of covid-19 have been characterized as gustatory dysfunction (GD) and olfactory dysfunction (OD). Anosmia (loss of smell) and ageusia (loss of taste) are experienced by 30% to 80% of covid-19 patients. As well, according to reports, serious cases of OD and GD afflict 60% and 40% of patients, respectively **(Santilli, 2020).**

Although many patients have been taking numerous medications as a result of covid-19 infection, patient education, or pharmaceutical counseling on proper medication consumption may be helpful. The use of certain medications, such as anticoagulants, non-steroidal anti-inflammatory medications, angiotensin-converting enzyme inhibitors, or angiotensin II receptor blockers, might cause adverse drug responses that require special attention. Patients with a higher risk of thromboembolism who could need long-term anticoagulant therapy must be closely monitored after leaving the hospital. The provision of pharmaceutical care in this situation can aid patients in avoiding inappropriate self-medication and enhancing careful compliance with prescribed medications **(Zheng et al., 2020).**

An instructional module referred to as a self-contained component focuses on a specific educational objective and includes documents, multimedia experiences, discussion forums, and information for the learner to use. A key component of actual reasoning rehabilitation is instruction, which calls for teaching various skills and ideas to people with impaired learning. Upon rehabilitation, an instructional module has regularly helped people get back on track in all facets of their lives, including social, emotional, intellectual, and physical, and figuring out how to live with a disability in light of their unique situation **(Guppy et al., 2023).**

Diaphragmatic exercises, forced expiration and cough exercises, linear load device training for the respiratory muscles, accessory muscle stretching, and physical therapy are all part of the respiratory rehabilitation process. Although some studies recommend

lengths of at least 6 to 8 weeks to maximize program effects, the length of a respiratory rehabilitation program will depend on the patient's medical or clinical state and comorbidities **(Liu, 2020).**

The rehabilitation instructional module uses a multidisciplinary intervention that assisted in defining their own issues, choosing a solution, and assessing the results of their actions. Through this learning process, patients can address their own issues, solve difficulties in novel ways, and deal with scenarios that weren't covered in the official rehabilitation program. Self-determination, effective coping mechanisms, participant satisfaction, and the minimization of limitations are all included. Also take into account psychological, financial, social difficulties and recovers functional independence **(Ghani et al., 2021).**

The rehabilitation instructional module used in covid-19 was specifically designed to enhance capacity for function, raise the quality of life as a whole simplify reintegration into society following hospitalization, lessen fatigue, dyspnea, ageusia, eating disorders, and dysphagia, and enhance ADL performance. In order to reduce the most negative effects of Covid-19, prompt rehabilitation programs should be made available to patients following discharge **(Borghi-Silva et al., 2021)**.

Significance of the study

By the end of 2021, 3.92 billion people will have been infected with SARS-CoV-2, according to the Institute for Health Metrics and Evaluation (IHME). Of these, 3.7% (144.7 million) will have post-covid-19 complaints, as defined by the WHO quantifiable situation description, and 15.1% (22 million) will have persistent warning signs that last for weeks, months, or even years after covid-19 complaints. Compared to those who have not had covid-19, more information has been learned about the long-term symptoms, problems, and impacts of the condition, including its effects on the lungs, heart, nervous system, and body **(World Health Organization, 2023).**

In Egypt, there have been 516,023 confirmed cases of COVID-19 with 24,830 fatalities reported to WHO between 3 January 2020 and 3:20 PM CEST on June 14, 2023. A total of 112,673,535 vaccine doses have been given as of May 20, 2023 **(WHO, 2023).** The prevalence of post-covid-19 symptoms was 87.63%, where the most frequent symptom was fatigue (60.86%) **(Abdelhafiz et al., 2022)**, about 38.82% of patients reported having post-COVID-19 symptoms. The most frequent symptoms were arthralgia

and myalgia, which affected 18.8% of patients, and post-viral tiredness, which affected 23.5% of those. A lower functional status was noted by 35.3% of these patients' post-COVID-19 symptoms **(Gamal et al., 2022)**.

Aim of the study:

This study aimed to determine the prevalence of functional health limitation among postgraduate students with post-coronavirus syndrome through:

- Assessing the prevalence of functional health limitation among post graduate students with post coronavirus syndrome
- Evaluate the effect of the instructional module upon rehabilitation of the studied postgraduate students.

Research question:

- What is the prevalence of post-covid-19 syndromes among the studied postgraduate students?

Research hypotheses:

H_1. There are positive improvements of postgraduate students with post-covid-19 syndromes at post-instructional module implementation than pre-implementation phase.

H_2. There are positive correlation between the studied postgraduate students' personal data and post-covid-19 functional status.

Subjects and Methods:

Research design: Longitudinal cohort; quasi-experimental retrospective data collection (individuals are sampled and information is collected about their past) **(George, 2023)**.

Setting: The study was conducted at Faculty of nursing, Helwan University.

Subjects: A convenience sample of all available postgraduate students (n=65) who consented to take part in the research and previously infected by virus corona and recovered with confirmed PCR negative but still had complaining from post-covid-19 syndrome until time of the study.

Tools for data Collection:

The following tools were used to gather data for this study:

Tool I: Post-covid-19 syndromes follow up screening structured interview questionnaire; after studying the relevant literature and research studies, the researchers created an Arabic questionnaire. It had the following components:

Part 1: Personal data: It includes postgraduate students' age, gender level of education, position, and years of experience.

Part 2: Health related questionnaire: It includes 13 yes or no questions related to students' health condition after corona virus. it includes postgraduate students' post-covid-19 syndrome related health condition. It includes 16 questions answered with yes or no questions around the potential effects of the patient's sickness which adopted from **(Kayaaslan et al., 2021)**.

Tool II: Post-covid-19 functional status (PCFS) scale. The PCFS scale is an immediate and simple self-report tool that is useful for identifying groups with different levels of physical, cognitive, and psychological health outcomes. Moreover, factors that can indicate a worsening functional state and even the requirement for rehabilitation at the time of hospital release were identified and adopted from **(Klok et al., 2020)**.

Scoring system: Post-covid-19 virus functional status (PCFS) scale, it includes 4 main items, if the answer is yes the patient (student) will rate the significance of impact on a scale of 1-4 (1 being no impact, 4 being significant impact). Total score was considered as the following; (1) for No or negligible functional limitations, (2) for mild or slight functional limitations, (3) for moderate functional limitations, (4) for severe functional limitations **(Klok et al., 2020)**. The score was summed and converted to quantitative data.

Tool III: Covid-19 rehabilitation screening questionnaire: about how the patient might have been affected since illness, it was adapted from **(O'Connor et al., 2022).** It includes 15 questions about how the patient might have been affected since illness, the questionnaire filled pre and post Instructional module implementation.

Scoring system: The covid-19 rehabilitation screening questionnaire, it includes 15 questions, if the answer is yes the patient (student) will rate the significance of impact on a scale of 0-10 (0 being no impact, 10 being significant impact). Total score was considered

as the following; 0=not at all, (1) mild impact=1-3, (2) moderate=4-6, (3) severe=7-9 and (4) extremely=10 **(O'Connor et al., 2022)**. The score was summed and converted to quantitative data.

Proposed instructional rehabilitation module: An instructional rehabilitation module was created after analysis of the studied postgraduate students pre-test post-covid-19 syndromes follow up screening questionnaire and post-covid-19 functional status (PCFS) scale, review of the literature, consultation with the advisor and other professionals, creation of health-related condition management criteria, initial draught creation, and application of content validity the creation of the final draught following the instructional rehabilitation module **(Benkalfate et al., 2022; Gamal et al., 2022).**

Operational Design:

The operational design included preparatory phase, pilot study, validity of the modified tool and reliability, ethical consideration, and field work.

Preparatory Phase:

In order to build the data collection techniques, it involved reviewing current and prior readable literature as well as theoretical knowledge about many parts of the study from books, papers, the internet, journals, and magazines.

Validity:

Face and content validity means the tool that measure what is proposed to be measured **(Middleton, 2023)**. It was demonstrated to a jury of five specialists from the medical-surgical and critical nursing staff at the Faculty of Nursing, Helwan University, to examine the tool for applicability, application, improvement, and authorization. Judges included professors and assistant professors from several academic fields. They were asked for their thoughts on the scoring system, consistency, and tool format layout.

Testing reliability:

It is the extent to which the utilized tools measure what was intended to be measured consistently, under identical conditions, and with the same participants **(Middleton, 2023)**. The reliability ratings of research instruments, including internal consistency, were high when it was examined using the Cronbach alpha test equally

(Cronbach's $\alpha = 0.891$& 0.821) for covid-19 rehabilitation screening and Post-covid-19 functional status (PCFS) scale, respectively, 95% confidence interval (CI) included. The allowable margin of error was set at 5%, while the confidence interval was set at 95%. Consequently, the p value was deemed significant at $P \leq 0.05$.

Ethical Considerations:

Following the researchers' official explanation of the study's aims and goals to the postgraduate student nurses who accepted to engage in the study, they obtained their formal consent from the nurses who consented to participate in the research procedure. The subjects were informed that they are allowed to choose to participate or not in the research and that they have the right to withdraw from the research at any time. The researchers assured that data collection was for research only and will not use for another purpose.

Administrative Design

The present study was carried out after taking an official permission from the ethics committee from the Faculty of Nursing, Helwan University, after the aim of the study were explained clearly. An official letter obtained from the dean of Faculty of Nursing, Helwan University and from the head of department. The study was approved by the ethical committee of Faculty of Nursing, Helwan University by (N0.31) by date 19-10-2022.

Pilot Study:

To test the tools' applicability and the clarity of the planned questionnaire, as well as to determine the ideal amount of time to complete the questions, a pilot research was conducted on a group of 10 nurses (or 10% of the sample). Eight of the students from the pilot study were included in the main study topic because the tools had not been modified, while two students were eliminated because they did not have post-COVID-19 syndrome or any other health-related issue.

Field Work:

After obtaining official permission to carry out the study; data collection was started and completed within 6 months from beginning of November 2022 until end of May 2023. The study conducted through four phases: Assessment, Planning, implementation, and

evaluation phase. Prior to any data collection, the researchers described the study's objectives to the postgraduate students' nurses who accepted to participate in the study. The researchers filled out and finished the study instruments twice (during the pre and post-implementation phases of the instructional module). The researchers were present at the Helwan University nursing faculty two mornings a week to gather information from the nurses under investigation. The tools were filled up in accordance with the postgraduate students' nurses' first-semester study program.

The collection of data was done through three phases:

Phase I: Assessment phase:

- The researchers collected data from postgraduate students' nurses at it begun by post-covid-19 syndromes follow up screening structured interview questionnaire, post-covid-19 functional status (PCFS) scale, and covid-19 rehabilitation screening questionnaire which had taken about (20-30) minutes to be filled in for every student to confirm presence of post-covid-19 syndromes and level of students' functional health limitation and level of post covid-19 rehabilitations. The researchers were observing what students said as it was happening. This phase was taking one-month for pilot study and tool validity and reliability.

Phase II: **Planning phase:**

Proposed instructional rehabilitation module:

- This phase was taking one-month for designing proposed instructional rehabilitation module for improvement of postgraduate students' nurses' functional health limitation and improvement of post-covid-19 syndrome quality of healthy life. Based on students' information preconditions, the researchers developed the instructional rehabilitation module in English language contents including knowledge regarding the mentioned post-covid-19 syndromes and appropriate nursing intervention and strategy to overcome functional health limitation **(Fugazzaro et al. 2022; Swarnakar & Yadav, 2022; WHO, 2022).**

.**Phase III: Implementation phase:**

- This phase was taking one-month; in this phase the postgraduate students' nurses divided into 3 groups. It was begun by post-covid-19 syndromes follow up screening structured

interview questionnaire, post-covid-19 functional status (PCFS) scale, and covid-19 rehabilitation screening questionnaire was filled in by postgraduate students' nurses within (20-30) minutes.

-The instructional rehabilitation module PowerPoint and audiovisual methods was explained to students over two days according to their study schedule of education. Through group discussion and role playing, the participants received one instructional rehabilitative module at a time. In the event of a misunderstanding, nurses were permitted to ask questions while listening and demonstrating interest in them. The researchers stressed that they will follow up with the participants three months after the program sessions ended.

Phase IV: Evaluation phase

- To assess the effect of the instructional rehabilitation module on postgraduate students' physical, cognitive, and psychosocial status before and after implementation, the covid-19 rehabilitation screening questionnaire was administered once more after 3 months.

Statistical Design:

Statistical Package for the Social Sciences version 24 was used to analyze the data that had been obtained. The presentation of qualitative data included number and percentage, mean, and standard deviation. To determine the relationship between the variables, a Chi-square test and a paired sample t-test were performed. The correlation coefficient (also known as person correlation) was used to examine relationships between various qualitative characteristics.. Probability (p-value) ≤ 0.05 was significant, < 0.001 was highly significant and > 0.05 was non-significant **(Salcedo & McCormick, 2021)**

Results

Table (1) Percentage distribution of the studied postgraduate students' personal data showed that 55.4% of the study sample between ages 20 to less than 30 years with Mean± SD 1.52±.64. As well, 66.2% of the studied students were females while 33.8% were males. In relation to level of education and work position; 44.6% of the studied students had bachelor degree, 35.3% of them had master degree while 20% of them had doctorate degree, and through 29.2 % of them were head nurses while 27.7 % of them were nurses.

Regarding the hospital workplace, 40% of the study sample worked inwards, and 58.5% of them had from 1 to less than 5 years of experience. In relation to the date of positive Swab, 41.5% of the study sample had a positive sample from 18 month, 46.2% of them stayed in the hospital for 3 weeks, 43.1% of the study sample were treated by supplemental oxygen while 16.9% of them were treated by respiratory support (CPAP).

Table (2) Descriptive statistics of post-covid-19 syndromes health related condition confirmed among the studied postgraduate students demonstrated that 55.4% of the studied students were still troubled by symptoms (64.6%,75.4%, & 70.8%) of the studied students had more breathless now than pre-covid-19 illness and felt fatigued compared to pr-covid-19, and had anosmia respectively. In relation to physical strength, 56.9% feel weak than before covid, 46.6% of them feel anxious/worrying more than before, and 66.2% lost weight since covid illness.

Table (3) Descriptive statistics of the studied postgraduate students' post-covid-19 syndrome confirmed functional health limitation explained that 52.3% of the studied students had severe functional health limitation status affection after being diagnosed with covid-19, (66.2%,86.2%, 81.5.%, &76.9%) of them had mild affection on the basic activity of daily living as eating, toileting, daily hygiene and walking, respectively. In relation to the instrumental activity of daily living, 73.8% had a mild need for assistance with local shopping and 27.8% had a moderate need for help in basic household tasks.

As regards participation in usual social roles, 55.4% of the studied students had a mild need to avoid or reduce duties/activities at home/work/study and 63.1% of them had problems with relationships or become isolated since covid-19 diagnoses. In relation to symptoms checklist, 76.9% of the studied students had mild reporting any symptoms resulting from covid-19 without experiencing functional limitation and 80% of them had mild problems with relaxing or experiencing covid-19 trauma.

Table (4) Comparison of descriptive statistics of post-Covid-19 rehabilitation screening questionnaire between pre and post-instructional module implementation throughout post-covid-19 syndrome phase illustrated that most of the studied subjects get improvement in general items related to post-Covid-19 rehabilitation screening questionnaire among post-instructional rehabilitation module implementation time and throughout personal adaptation with post-covid-19 syndromes as enhancement of breathlessness; 29.2% of the studied students affected by covid-19 and had mild

breathlessness post-instructional module implementation compared to 43.1% of them post-covid-19 infections and 36.9% who had severe laryngeal /airway complications.

Additionally, 86.2% of them did not have breathlessness on dressing, any change in cognitive-communication, and post-traumatic stress disorder. In relation to any problems in personal care, any problem in bowel incontinence, and depression all of them had not had it pre covid and all of them had problems in mobility now.

Table (5) Correlation between personal data of the studied postgraduate students and total post-covid-19 functional status scale showed that there was a highly significant correlation between the studied postgraduate students (age, gender, and hospital workplace) and total post-covid functional status scale with the presence of a significant correlation between (years of experience and educational level and length of hospital stay) and total post covid functional status scale.

Table (1): The percentage distribution of the studied post-graduate students personal data (n=65).

Items	N	%
Age Category		
20-<30y	36	55.4
30- <40y	24	36.9
40 and more	5	7.7
Mean± SD	**1.52±.64**	
Gender		
Male	22	33.8
Female	43	66.20
level of education		
Bachelor degree	29	44
Master degree	23	36
Doctorate degree	13	20
Position		
Nurse	18	27.7
Charge Nurse	16	24.6
Head Nurse	19	29.2
Clinical instructor	12	18.5
Hospital work place		
Emergency department	15	23.0
Ward	26	40.0
ICU	12	18.5
University work	12	18.5
Years of experience		
1-<5	38	58.5
5-<10	19	29.2
10 and more	8	12.3
Date of positive swab		
From 6 month	16	24.6
From12 month	22	33.8
From18 month	27	41.5
Length of hospital stay		
2weeks	23	35.4
3weeks	30	46.2
Month	12	18.5
Level of respiratory support during acute illness:		
-Intensive therapy unit, intubated		
-Enhanced respiratory support (e.g.CPAP).	10	15.4
- Intensive therapy unit supplemental oxygen	11	16.9
-post discharge supplemental oxygen at home	8	12.4
-Managed in community before hospital admission	27	43.1
	8	12.4

Table (2): Descriptive statistics of post-covid-19 syndromes health related condition confirmed among the studied postgraduate students (n=65).

Items	N	%
Made full negative CRP but still troubled by symptoms		
Yes	29	44.6
No	36	55.4
More breathless now than before covid-19 illness		
Yes	42	64.6
No	23	35.4
- Breathless is more than expected by now, and on the way back to full fitness		
Yes	24	36.9
No	41	63.1
Feel fatigue compared before covid		
Yes	49	75.4
No	16	24.6
-Fatigue is more than expected by now and on the way back to full fitness		
Yes	38	58.5
No	27	41.5
Have cough different from any cough before covid-19		
Yes	30	46.2
No	35	53.8
Get any palpitations		
Yes	20	30.8
No	45	69.2
Physical strength(weak than pre covid illness)		
Yes	37	56.9
No	28	43.1
Have any myalgia(aching in muscles)		
Yes	27	41.5
No	38	58.5
Have anosmia(no sense of smell)		
Yes	46	70.8
No	19	29.2
Lost sense of taste		
Yes	28	43.1
No	37	56.9
Sleep disturbed more than pre covid		
Yes	24	36.9
No	41	63.1
Have any nightmares or flashbacks		
Yes	19	29.2
No	46	70.8
Mood is low fell lacking in motivation/ no pleasure in anything		
Yes	34	52.3
No	31	47.7
-Feel anxious /worrying more than before		
Yes	42	64.6
No	23	35.4
Lost weight since covid-19 illness		
Yes	43	66.2
No	22	33.8

Table (3): Descriptive statistics of the studied post-graduate students' post-covid-19 syndrome confirmed functional health limitation (n=65).

Items	Post-covid functional status scale (PCFS)							
	No functional limit(1)		Mild (2)		Moderate (3)		Severe (4)	
	N	%	N	%	N	%	N	%
Survival Has the patient suffered after the covid 19 diagnosis	--	--	--	--	31	47.7	34	52.3
Constant care Require constant care	31	47.7	34	52.3	--	--	--	--
Basic activities of daily living (ADL)								
-Assistance essential for eating	43	66.2	22	33.8	--	--	--	--
-Assistance essential for using toilet	56	86.2	9	13.8	--	--	-	-
-Assistance essential for routine daily hygiene	53	81.5	12	18.5	-	--	-	-
- Assistance essential for walking	50	76.9	15	23.1	-	-	-	-
Instrumental activities of daily living (IADL)	12	18.5	35	53.8	18	27.7	-	-
-Assistance essential for basic household tasks	25	38.5	27	41.5	13	20	-	-
-Assistance essential for local travel	48	73.8	17	-	-	-	-	-
-Assistance essential for local shopping								
Participation in usual social roles								
-Adjustment essential for duties/activities at home or at work/study	21	32.3	38	58.5	6	9.2	-	-
-Need to avoid or reduce duties/activities at home/work/study.	29	44.6	36	55.4	-	-	-	-
-Not take good care of loved ones as before.	24	36.9	23	35.4	18	27.7	-	-
-Since the covid 19 diagnosis, there have been problems with relationships or become isolated	41	63.1	24	36.9	-	-	-	-
-Restricted in participating in social and leisure activities.	36	55.4	29	44.6	-	-	-	-
Symptom checklist								
-Report symptoms through which usual duties/activities need to be avoided	28	43.1	26	40.0	11	16.9	-	-
- Report any symptoms resulting from covid 19without experiencing functional limitations.	50	76.9	15	23.1	-	-	-	-
-Have problems with relaxing or experience covid 19 trauma	52	80.0	13	20.0	-	-	-	-

Table (4): Comparison descriptive statistics of the studied post-graduate students' post-Covid-19 rehabilitation screening between pre and post-instructional module implementation throughout post-covid 19 syndrome phase (n=65).

Items	Covid-19 rehabilitation screening									
	Not at all (0)		Mild (1)		Moderate (2)		Severe (3)		Extremely (4)	
	N	%	N	%	N	%	N	%	N	%
Breathlessness at rest										
pre-instructional module	20	30.8	28	43.1	6	9.2	7	10.8	4	6.2
post-instructional module	46	70.8	19	29.2	-	-	-	-	-	-
Breathlessness on dressing										
pre-instructional module	10	15.4	29	44.6	14	21.5	6	9.2	6	9.2
post-instructional module	56	86.2	9	13.8	-	-	-	-	-	-
Breathlessness on walking up flights of stairs.										
pre-instructional module	-	-	-	-	20	30.8	29	44.6	16	24.6
post-instructional module	38	58.5	27	41.5	-	-	-	-	-	-
Laryngeal/airway complications										
pre-instructional module	-	-	3	4.6	31	47.7	24	36.9	7	10.8
post-instructional module	58	89.2	7	10.8	-	-	-	-	-	-
Any change in Voice										
pre-instructional module	44	67.7	21	32.3	-	-	-	-	-	-
post-instructional module	65	100	-	-	-	-	-	-	-	-
Difficulty in swallowing										
pre-instructional module	34	52.3	20	30.8	11	16.9	-	-	-	-
post-instructional module	51	78.5	14	21.5	-	-	-	-	-	-
Any nutritional concerns										
pre-instructional module	-	-	15	23.1	35	53.8	15	23.1	-	-
post-instructional module	60	92.3	5	7.7	-	-	-	-	-	-
Any problems in mobility										
pre-instructional module	60	92.3	5	7.7	-	-	-	-	-	-
post-instructional module	65	100	-	-						
Become fatigued										
pre-instructional module	-	-	10	15.4	37	56.9	18	27.7	-	-
post-instructional module	59	90.8	6	9.2	-	-	-	-	-	-
Any problems in personal care										
pre-instructional module										
post-instructional module	19	29.2	30	46.2	16	24.6	-	-	-	-

	65	100	-	-	-	-	-	-	-	-
Any problems in bowel continence										
pre-instructional module	45	69.2	20	30.8	-	-	-	-	-	-
post-instructional module	65	100	-	-	-	-	-	-	-	-
Any change in cognitive communication										
pre-instructional module	27	41.5	21	32.3	17	26.2	-	-	-	-
post-instructional module	56	86.2	9	13.8	-	-	-	-	-	-
Anxiety										
pre-instructional module	-	-	10	15.4	36	55.4	19	29.2	-	-
post-instructional module	60	92.3	5	7.7	-	-	-	-	-	-
Depression										
pre-instructional module	40	61.5	17	26.2	8	12.3	-	-	-	-
post-instructional module	65	100	-	-	-	-	-	-	-	-
Post-traumatic stress disorder (PTSD) screen. (any unwanted memories or dreams of illness										
pre-instructional module	18	27.7	35	53.8	12	18.5	-	-	-	-
post-instructional module	56	86.2	9	13.8	-	-	-	-	-	-

Table (5): Correlation between total post-covid-19 functional status scale and personal data of the studied post-graduate students (n=65).

Items	Age	Gender	Hospital work place	Years of experience	Educational level	Date of positive swab	Length of hospital stay
Sum PCFS	.000**	.017*	.003**	.001**	.124	.000**	.000**

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is highly significant at the 0.01 level (2-tailed)

Discussion

Since the covid-19 pandemic epidemic, the majority of attention has been directed toward reducing the spread of the SARS-CoV-2 and managing the rise in the number of critically sick patients receiving care in acute care facilities. It is anticipated that covid-19 may have a major impact on individuals who have mild disease presentations as well as their physical, cognitive, mental, and social health status. Previous coronavirus outbreaks have been linked to ongoing pulmonary function impairment, muscle weakness, pain, exhaustion, anxiety, depression, work-related issues, and a lower quality of life **(Klok et al., 2020).**

The covid-19 pandemic has a wide range of consequences. Prior, sparse research has focused on the high frequency and variability of post-covid-19 symptoms. Undoubtedly, a wide range of symptoms, including asthenia, muscle weakness, anxiety, sadness, sleep disruption, and pulmonary manifestations, have been identified up to six months following the acute phase of covid-19. Even though the majority of these symptoms are curable, some persist over time and profoundly impact day-to-day living. They could develop into chronic diseases with substantial public health and economic repercussions if they are not treated seriously **(Kamal et al., 2021).**

Concerning the percentage distribution of the studied postgraduate students' personal data; the results of the current revealed that, more than half of the study sample was between ages 20 to less than 30 years with Mean± SD 1.52±.64. more than three-fifth of the studied students were females while more than one-third were males. As well, a third of them were head nurses while more than quarter of them were staff nurses with more than half of them had from 1 to less than 5 years of experience. About the date of positive swab, two-fifths of the study sample had a positive sample from 18 months, less than half of them stayed in the hospital for 3 weeks, and treated with supplemental oxygen while a minority of them was treated by respiratory support (CPAP).

The study's findings matched those of the research that was applied by **Mohamed-Hussein et al. (2022),** entitled "Post-covid-19 functional status: relation to age, smoking, hospitalization, and previous comorbidities" and reported that the study involved 444 participants. The study subject involved more than one-third was males and less than two-thirds was females with the mean age were 33.09 ± 12.09 years ranged from 18–86 years. The mean duration since the onset of symptoms was 35.31 ± 18.75 days, three-quarters were admitted to hospitals, more than twentieth required oxygen therapy, and minority of them needed ICU.

However, the outcome of the research completed by **Pant et al. (2021),** authorized "Prevalence of functional limitation in covid-19 recovered patients using the post-covid-19 functional status scale" and stated that there were less than two-thirds were males while one-third was females. Nearly half of the patients were healthcare workers comprising more than one-quarter were doctors, more than a tenth was nurses and less than a tenth were the paramedical staff.

From the researchers point of view, theses the consequences of the pandemic, accounted for the effect of the covid-19 pandemic on both dimensions of age and occupational risk taken together, suggesting specific risks increase through individual when interacting as well as similarities between individuals syndrome.

In relation to the studied postgraduate students' post-covid-19 health-related condition, the current study shows that more than half of the studied students are still troubled by symptoms, including two-thirds were breathless now than pre-covid illness, three-quarters were feeling fatigued compared to pre-covid, and three-fifths had anosmia. In relation to physical strength, more than half feel weak compared to pre-covid infection, less than half of them feel anxious/worrying more than before, and more than two-thirds of them lost weight since covid illness.

As well, the results of the study published by **Fernández-de-Las-Peñas et al. (2021),** entitled "Prevalence of post-covid-19 symptoms in hospitalized and non-hospitalized covid-19 survivors: A systematic review and meta-analysis" demonstrated that around three-fifths and less than half of the study subjects presented ≥one post-covid-19 symptom at 1, 2, or ≥3 months post- outbreak/hospital care. The most common symptoms were fatigue and dyspnea with a collective incidence ranging from one to two-thirds hinge on the follow-up. The remaining post-covid-19 syndrome contained only one-quarter had cough and the others ranged from tenth to twentieth had anosmia, ageusia, or joint pain.

These results were consistent with the study result applied by **Borghi-Silva et al. (2021**) authorized "Importance of functional capacity assessment and physical exercise during and after hospitalization in covid-19 patients: revisiting pulmonary rehabilitation" and mentioned that, after being discharged, patients with covid-19 and extended hospital stays may experience a variety of functional difficulties. Neuromusculoskeletal issues, such as neuropathy and muscle weakness, dyspnea, severe hypoxemia, anxiety and/or depression, considerable weight loss, and cardiovascular consequences are some of the post-covid-19 symptoms. Therefore, it's important to investigate these functional limits

both after discharge and in the first stages of rehabilitation during the convalescence phase.

Furthermore, **Augustin et al. (2021)** finished a study about "Post-covid-19 syndrome in non-hospitalized patients with post-covid-19: a longitudinal prospective cohort study" and found in observed samples included 442 and 353 patients over 4 and 7 months post-covid-19 infection, less than tenth of patients had shortness of breath and fatigue, more than tenth had anosmia and ageusia. A minor standard level of SARS-CoV-2 IgG, anosmia, and diarrhea during acute COVID-19 was associated with a greater possibility of long-term syndrome.

From the researchers' point of view, the healthcare team especially nurses are regarded "essential," with fewer possibilities to work from home to reduce the risk of infection, suggesting that the overall health risk for the investigated group is radically high when compared to scenarios of employment in other jobs.

The present study explains that more than half of the studied postgraduate students had severe functional status affection after diagnosis of post-covid-19, and the majority of the postgraduate students had mild affection for the basic activity of daily living as eating, toileting, daily hygiene, and walking. In relation to the instrumental activity of daily living, less than four-fifths of the subjects had a mild need for assistance with local shopping and about quarter of the subjects had a moderate need for help in basic household tasks.

As regards participation in usual social roles, more than half of the studied students had a mild need to avoid or reduce duties/ activities at home/work/ study and around three-fifths of them had problems with relationships or become isolated. Since covid-19 diagnosis, In relation to symptoms checklist, less than four-fifths of the studied students had mild reporting any symptoms resulting from covid-19 without experiencing functional limitation and the majority of them had mild problems with relaxing or experiencing covid-19 trauma.

In the same line the result of the study done by **Pant et al. (2021),** illustrates that More than half of the patients reported having no functional limitations (PCFS grade 0) through the post-covid-19 recovery period after RT-PCR negative status, while fewer than half of patients had some degree of functional limitation. From the researchers' point of view, even health care team patients from various groups were urged not to seek medical

care until hospitalization was required. Testing might not have been judged required if people were feeling ill but did not require a ventilator.

The post-covid-19 functional status (PCFS) scale focuses on related features of daily life during the follow-up stage post-infection. The scale is designed to assist patients become informed of current functional limitations in post-covid-19 patients efficiently to objectively figure out this degree of disability, as such, the extent is not meant to change other relevant instruments for measuring the quality of life, tiredness, or dyspnea, but is established to use as an supplementary tool for estimating the definitive consequences of covid-19 on functional status **(Benkalfate et al., 2022)**.

In relation to post-covid-19 rehabilitation screening before and after instructional rehabilitation module implementation, the current study illustrates that less than half of the studied students affected by covid and had mild affection post-instructional rehabilitation module implementation, while 86.2% of them did not have breathlessness on dressing, not had any change in cognitive-communication, and not had post-traumatic stress disorder post-covid-19. Conversely, more than one-third still had severe laryngeal /airway complications. Furthermore, all of them had not had any problems with personal care, bowel incontinence, depression, or in mobility.

This result was approved with the study results conducted by **Harenwall et al. (2022)** regarding **"**The interactive effects of post-traumatic stress symptoms and breathlessness on fatigue severity in post-covid-19 syndrome" and found that the post-traumatic stress symptoms and breathlessness significantly enhanced the post-rehabilitation program, which clarified 18% of variations in fatigue with considerable and a notable indicator ($\beta = 0.41$, $t = 2.45$, $p = 0.016$, $BF10 = 20.97$) and PTSS may exacerbate physical symptom presentation. Certainly, breathlessness and fatigue were significantly correlated in patients who reported PTSS ($r = 0.38$, $p < 0.001$).

This result was disagree with the results of the study conducted by **Wang et al. (2020),** about "Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus -infected pneumonia in Wuhan, China" and mentioned that numerous post-covid-19 patients in the rehabilitation stage were suffering from functional limitations including physical activity that places varied degrees of restriction on activities connected to job-related, community, vacation, or social activities and interactions. Moreover, the study resulted identified that the exercise proficiency and medical examination status of the post-covid-19 recovered situation was substantially lowest than the normal public follow-up (after 6 month). Functional lung injury increased, and the functional weakness

became out of proportion to it. In some cases, it was also accompanied by muscle weakness.

According to researchers, factors like the availability of information and decision-support tools, health literacy, health status, trade-offs between results and potential economic and social repercussions, the complexity of the health system, and individual costs like time and out-of-pocket expenses can have an impact on post-covid patients.

The present study illustrated that, there is a highly significant correlation between age, gender, hospital work place and total post covid functional status scale .There is also a significant correlation between years of experience and educational level and length of hospital stay.

This results matched with the result of the study finished by **Mohamed-Hussein et al. (2022),** who discovered that, the degree of functional activity limitation (based on PCFS score) significantly varied with age (P = 0.003), gender (P = 0.014), the time since the onset of COVID-19 symptoms (P 0.001), the need for oxygen supplementation (P 0.001), ICU admission (P = 0.003), and finally the presence of any comorbid disorders (P 0.001). There were associations between both demographic and clinical characteristics of the study group and their PCFS.

In the same sentence the study results done by **Gamal et al. (2022),** entitled "Post-covid-19 syndrome in a prospective cohort study of Egyptian patients" definitude that there was a significant functional influence was originated in post-covid-19 infected patients with post-covid-19 syndromes. Additionally, age, education, working condition, severity or stages of the disease and presence of preexisting comorbidities are critical risk factors for the development of post-covid-19 syndrome and functional health limitations.

On the other hand the result of the study explored by **Tejerina et al. (2022),** in conducted study about" Post-covid-19 syndrome. SARS-CoV-2 RNA detection in plasma, stool, and urine in patients with persistent symptoms post-covid-19"and found that more than half of the participants reported experiencing three or more symptoms. Additionally, less than half of patients had severe functional disability and three-quarters of patients had moderate to severe limitation were observed with no correlation.

From the researchers' point of view, the healthcare team especially nurses identify themselves as long haulers, have helped contribute to the recognition of post-covid-19 syndrome which characterized by persistent symptoms, delayed or long-term

complications beyond weeks and months from the onset of symptoms. Here, researches provide a comprehensive instructional rehabilitation module on post-acute covid-19, its pathophysiology and its organ-specific sequelae, and relevant considerations for improvement of health-related needs and functional limitations enhancement.

Conclusion:

Based on the findings of the present study, it can be concluded that: The results of the current study supported the hypothesis of the study that there were around three fifths of the studied students were still troubled by post-covid-19 syndromes including breathless and felt fatigued, anosmia, physical weakness, feel anxious/worrying, and lost weight since covid illness. Additionally, the majority of the studied students had functional health limitation status affection after being diagnosed with covid-19 as had mild affection on the basic activity of daily living as eating, toileting, daily hygiene, walking, social roles, and experiencing post-covid-stress trauma..

The most of the studied subjects get improvement in general items related to post-covid-19 rehabilitation screening questionnaire among post-instructional module implementation phase and throughout personal adaptation with post-covid-19 syndromes. Furthermore, a highly significant correlation presented between the studied postgraduate students (age, gender, and hospital workplace) and total post-covid functional status scale with the presence of a significant correlation between (years of experience and educational level and length of hospital stay) and total post covid functional status scale.

Recommendations:

The following suggestions can be made based on the current study's findings:

- Future researches are requisite to enhance post-covid-19 syndromes interventions program to enhance functional health limitation.
- Create and manage a diverse team effort for providing continuous evaluation of post-covid-19 patients with persistent syndromes.
- Develop general self-instructional rehabilitation module on digital interventions for treating long-post-covid symptoms.
- Design educational programs written in Arabic and implement regular updating of patients' knowledge and practice regarding post-covid-19 syndrome.

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الملخص العربى

انتشار قيود الصحة الوظيفية لدي طلاب الدراسات العليا المصابين بمتلازمة ما بعد كوفيد-19: وحدة تعليمية

المقدمة: منذ بداية انتشار وباء فيروس كورونا 2019، ويتلقى الناجون من كوفيد-19 غالبية الاهتمام. هذا على الصعيد العالمي ، بسبب ارتباط معدل الوفيات المرتفع ووجود متلازمات ما بعد كوفيد -19 المصاحبة بدرجات متفاوتة من ضعف وظائف الرئة المستمر وضعف العضلات والألم والإرهاق والاكتئاب والمشاكل المهنية مستوي جودة الحياة. **الهدف:** أجريت هذه الدراسة تحديد انتشار قيود الصحة الوظيفية لدي طلاب الدراسات العليا المصابين بمتلازمة ما بعد كوفيد-19. **التصميم:** دراسة جماعية طولية ستجمع بيانات بأثر رجعي عن طلاب الدراسات العليا المصابين سابقًا بفيروس كوفيد-19 منذ بداية الوباء. **المكان**: أجريت الدراسة كلية التمريض جامعة حلوان. **العينة**: تم اختيارعينة هادفة من (65) طالب الدراسات العليا الذين سبق لهم الإصابة. **الأدوات**: (1) استبيان فحص متابعة متلازمة ما بعد كوفيد -19، (2) مقياس الحالة الوظيفية لما بعد كوفيد -19 ، و (3) فحص إعادة التأهيل بعد كوفيد -19. **النتائج:** تظهر الدراسة أن عانى 52.3٪ من الطلاب المدروسين بشدة من تشخيص متلازمة ما بعد كوفيد -19 ويحتاجون إلى رعاية مستمرة مع (44.6٪ و 80.0٪) منهم مجبرون على تجنب الواجبات / الأنشطة المطلوبة ويعانون من قيود صحية وظيفية وصدمات ما بعد كوفيد -19. **الخلاصة:** كان هناك تحسن في معظم نقاط مقياس إعادة التأهيل بعد تطبيق الوحدة التعليمية علي الطلاب الذين شملتهم الدراسة، وكان لديهم درجات مختلفة من القيود الصحية الوظيفية مع وجود علاقة ارتباط ذات دلالة إحصائية بين الأعمار والجنس ومكان العمل في المستشفى وإجمالي مقياس الحالة الوظيفية بعد كوفيد -19 والبرنامج التدريبي. وهناك أيضًا ارتباط كبير بين سنوات الخبرة والمستوى التعليمي ومدة الإقامة في المستشفى و بين مقياس التأهيل. **التوصيات:** تطوير استراتيجية فريق لمتابعة المرضى الذين يعانون من متلازمة ما بعد كوفيد -19 ، وزيادة الوعي السريري للمرضى والمراقبة الذاتية المثقفة في المنزل للوقاية من قيود الصحة الوظيفية لتحسين نتائج المرضى.

مفاتيح الكلمات: طلاب الدراسات العليا ، والوحدة التعليمية ، والقيود الصحية الوظيفية ، ومتلازمة ما بعد كوفيد -19.