Long Lasting Effect of Covid-19 Viral Load On Medical Staff In Isolation Hospitals

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ABSTRACT

Background : *Lymphedema is large problem affect women after surgical removal of breast Background The highly contagious virus known as Coronavirus disease 2019 (COVID-19) which was passed on by the SARS-CoV-2 virus, generates severe acute respiratory syndrome.it had a disastrous impact on global demography, causing almost 7 million deaths by March 2023. One of the most common problem associated COVID-19 lung problem such as pneumonia , acute respiratory distress syndrome & ground glass opacity which may indicate lung fibrosis .* ***Purpose:*** *to investigate the prevalence of the long-lasting effect of COVID-19 viral load one year after closure of isolation units in isolation hospitals on medical staff. Subject and method: Participants in this study were 100 medical staff members(physician, nurse & physiotherapist) who worked in isolation hospitals during the pandemic from March 2020 to August 2022 . Aerobic capacity was measured with a 6-minute walk test, and pulmonary functions were measured with a portable spirometer. Result: The people participated, 56% had affection for pulmonary functions. The prevalence of pulmonary function affection was significantly higher in patients who were obese, overweight, female physiotherapists, and worked for excessed 2 years (p=0.001), (p=0.02), (p=0.04), as well as (p=0.001); however, there were non-significant association found between age and pulmonary functions affection (p = 0.63).* ***Conclusion :****there was affection on pulmonary functions in medical staff of isolation hospitals in relation to BMI, sex & professions.*

Key words: *Covid-19, long lasting effect , pulmonary functionss.*

INTRODUCTION

The highly contagious virus known as Coronavirus disease 2019 (COVID-19) which was passed on by the SARS-CoV-2 virus, generates severe acute respiratory syndrome.it had a disastrous impact on global demography, causing almost 7 million deaths by March 2023[1]. Lung issues imposed on by COVID-19 include pneumonia. Also, in serious situations, acute respiratory distress syndrome (ARDS). Sepsis as well as, another complication of COVID-19, which can identically permanently damage the lungs and other organs. In some cases, damage to lung that take several months to improve [2]. After investigation there was reduction in total lung capacity (TLC), forced vital capacity (FVC), forced expiratory volume (FEV1), FEV1/FVC ratio [3]

The viral load is comparatively higher in COVID-19 patients who have had extensive medical care in the intensive care unit. Additionally, it seemed that the larger viral load was linked to the disease's increased transmissibility [4].

Medical staff that experienced symptoms had elevated viral loads and brief symptom duration, both of which were linked to peak infectivity [5] A person with COVID-19 who is asymptomatic can transmit the virus [6].

One of the main viruses that affects medical personnel significantly is SARS-COVID-2. In a preliminary Wuhan, China case series, 29% of SARS-CoV-2 patients were medical professionals, and it was thought that they contracted the illness in a hospital [7] Age, high body mass index and female gender have been determined to be the main risk factors for persistent symptoms[8].

Patients and Methods

Study design

Cohort retrospective study designed to investigate the prevalence of the long-lasting effect of covid-19 viral load one year after closure of isolation units in isolation hospitals on medical staff. Research Ethics Committee of the Faculty of Physical Therapy has given its approval to this study's protocol P.T.REC/012/004432

Participants

Subjects' selection:

The sample size was calculated using the G*Power software (version 3.0.10). Considering a power of 0.80, α level of 0.05 (two tailed) and Correlation pH1 of 0.3, pH0 of 0; a generated sample size of at least 84 subjects, adding 13 subjects (15% as drop out), so total sample size of 97 subjects is required. One hundred medical staff were assessed from isolation hospital in The Nile Badrway hospital, starting from April 2023 to august 2023, All subjects were properly informed about the study's goal and procedures before to the experiment, and they all accepted to participate in the current investigation.

Inclusion criteria: -

Medical staff aged from 35 to 45 years old . Medical staff from all team members (physician, nurse, physiotherapist).Medical staff should work at least 1 year in isolation hospital during pandemic period. Medical staff should quited working in isolation area at least 6 months before assessment. Medical staff have been vaccinated.

Exclusion criteria: -

Any respiratory disease (asthma , COPD , allergy ,…etc)before COVID-19 epidemic.

Any cardiovascular disease, neurological disorder, and autoimmune disease.

Measurement procedures

Pulmonary functions test:-

for enrollment in the study pulmonary functions(FVC, FEV1,FEV1/FVC,PEF,FEF25-75%) was measured as follow:

The participant was requested to be seated during the test in order to monitor pulmonary functions. his nostrils were kept closed with a nasal clip that was placed on the nose. The participant was instructed to inhale deeply and exhale as forcefully as they can into the tube for a few seconds.

It was crucial that to close the tube with lips to prevent air leakage. To ensure that the results are fairly consistent, the subject would need to complete the test at least three times.

The test may be retaken if there was excessive variation of the 3 trials. The highest value from three closely spaced test results is used to determine the final outcome [9].

ii. Endurance and aerobic capacity:-

• Before beginning the six-minute walk test, the tester would typically use a pulse oximeter to take the blood pressure, pulse and oxygen level.

A straight, level hallway Length: 30 meters (100 feet). The subject should dress comfortably and walk around in comfortable shoes.

Prior to the test, the individual spends at least ten minutes relaxing in a chair (i.e., no warm-up phase).

Set the timer for six minutes and the lap counter at zero. Give the topic instructions: Remember that the goal was to walk for six minutes as far as possible; Avoid jogging or running.

Gently turn around the 2 orange cone fixed on the ground at the beginning and end of 30 meters of the corridor. Every minute, identical assurances of support at intervals of one minute, such "You were performing fine. "You've got _ minutes left," and "Never give up." You have _ minutes remaining." Mark the patient's stop point on the floor at the conclusion of the exam. Take note of the SpO2 and pulse rate while using a pulse oximeter. Determine how far you traveled and note it [10].

Outcome measurements: -

FVC which measure to differentiate between obstructive and restrictive lung disease , FEV1 which measure to diagnose lung disease such as asthma &COPD , PEF reliable indicator of ventilation it can dedect asthma and chronic lung disease, FEF it’s marker of small airway obstruction to identify restrictive lung disease , FEV1/FVC to monitor lung condition .

Blood pressure, oxygen saturation, heart rate (all before and after), and distance was assessed during 6 minute walk test.

Data analysis:

The collected data were statistically analyzed utilizing:

Descriptive statistics (mean, standard deviations, frequencies in addition to percentage). Mean and Standard deviation were used to summarize quantitative variables. The frequencies and percentages were used to summarize the categorical variables.

To examine the relationship between pulmonary function affection and risk variables of COVID-19 which are (age, gender ,BMI, period of work , distance between caregiver and patient), logistic regression, chi-square statistics (Fisher Exact test) were used.

Software from SPSS, Inc., Chicago, IL, version 25 will be utilized in statistical analysis. The level of significance for all

statistical tests was set at $p < 0.05$.

RESULTS

Subject's characteristics

1-Demographic Data: 100 medical staff members who worked in isolation hospitals were recruited in this study. The 35 participants (35%) were doctors, 38 participants (38%) were nurses, and 27 of the participants (27%) were physiotherapists.

Demographic data of the medical staff members who involved in the study: the mean Age & BMI were 38.19 ± 2.56 years and 27.25 ± 2.83 kg/m² respectively. There were 37 (37%) of subjects were females and 63 (63%) of subjects were males. Table 1 shows the subject characteristics.

Table1. demographic data and risk factor of participants :-

	N	***%***
Age		
35-38years	61	61%
39- 45 years	39	39%
Sex		
Females	37	37%
Males	63	63%
BMI		
Normal weight(18.5–24.9 kg/m²)	16	16%
Overweight(25.0–29.9 kg/m²)	70	70%
Obese(≥ 30 kg/m²)	14	14%
Profession		
Physician	35	35%
Nurses	38	38%
Physiotherapist	27	27%
Work period		
12- 18 month	51	51%
19-30 month	49	49%

Prevalence of pulmonary function

As demonstrated on the table (2) the prevalence of pulmonary functions affection among participants was 56% with 46.23- 65.33% of 95% CI.

The mean ± SD FVC, EFV1, FVC/FEV1 were 3.22 ± 0.94 L, 2.92 ± 0.91 L and 90.17 ± 11.14% respectively.

The mean ± SD PEF and FEF25-75 was 363.14 ± 154.24 L/min and 3.37 ± 1.23% respectively.

The mean ± SD 6MWD was 412.81 ± 47.36 m with 320 meters as the minimum value and 550 meters as the maximum.

Association between pulmonary function and subject characteristics:

As demonstrated on the table (3) it revealed that no significant association was detected among age and pulmonary functions affection (p = 0.63). there were significance increase in the prevalence of pulmonary functions affection in participants that overweight and obesity in contrast to normal weight (p <0.001). there were significance increase in the prevalence of pulmonary functions affection with female subjects in contrast to males (p= 0.02). There was a significance increase in the prevalence of pulmonary functions affection in physiotherapist in contrast to physician and nurses (p=0.04). There were significance increase in prevalence of pulmonary functions affection in subjects worked 19-30 months compared with subjects worked 12- 18 months (p < 0.001).

Predicting the participants' risk factors:-

As demonstrated on the table (4), According to univariate analysis BMI , sex, and work duration.

had a significant association with pulmonary function affection, while profession had not significant association.

Subjects with overweight were 11.15 times more probable to pulmonary functions affection in contrast to individuals with normal weight (Odds Ratio = 11.15, 95% CI2.35-52.94, p=0.002).
Individuals that are obese 25.67 times more probable to pulmonary functions affection in contrast to individuals with normal weight (Odds Ratio=25.67, 95% CI3.63-181.44, p=0.001).

Females were 2.6 times more probable to pulmonary functions affection in contrast to males (Odds Ratio =2.6, 95% CI1.01-6.15, p=0.03).

Subjects working 19- 30 months were 40.91 times more probable to pulmonary functions affection in contrast to subjects working 12-18 months (Odds Ratio= 40.91, 95% CI 12.06-138.71, (p=0.01).

The primary determinants of pulmonary functioning were identified using multivariate logistic regression affection by entering variables that had a significant association with the affection of the lungs. Overweight, obesity and 19-30 working months were the significance factors for pulmonary functions affection (p < 0.01).

Table 2. ***Prevalence of pulmonary functions affection among participants.***

	Prevalence		**95% CI**	
Pulmonary functions affection	56 (56%)		46.23- 65.33%	
Pulmonary function and functional level among participants				
	$\overline{X}$ **±SD**	**Minimum**	**Maximum**	**Range**

FVC (L)	3.22 ± 0.94	1.10	6.20	5.10
FEV1 (L)	2.92 ± 0.91	0.48	4.88	4.40
FEF25-75 (%)	3.37 ± 1.23	0.32	6.27	5.95
FEV1/FVC (%)	90.17 ± 11.14	40.10	100.00	59.90
PEF (L/min)	363.14 ± 154.24	70.80	699.00	628.20
6MWD (m)	412.81 ± 47.36	320.00	550.00	230.00

Standard deviation (SD) and confidence interval (CI)

Table3. ***frequency of pulmonary functions affection among participants and association with subject characteristics.***

	Pulmonary functions affection		**χ^2 value**	**p -value**
	Yes	**No**		
Age classes				
35-38 years	33 (54.1%)	28 (45.9%)	0.23	0.63
39- 45 years	23 (59%)	16 (41%)		
Sex				
Females	26 (70.3%)	11 (29.7%)	4.85	0.02
Males	30 (47.6%)	33 (52.4%)		
BMI classes				
Normal weight(18.5–24.9 kg/m²)	2 (12.5%)	14 (87.5%)	16.02	0.001
Overweight(25.0–29.9 kg/m²)	43 (61.4%)	27 (38.6%)		
Obese(≥ 30 kg/m²)	11 (78.6%)	3 (21.4%)		
Profession				
Physician	15 (42.9%)	20 (57.1%)		
Nurses	21 (55.3%)	17 (44.7%)	6.04	0.04
Physiotherapist	20 (74.1%)	7 (25.9%)		
Working years				
12- 18 month	11 (21.6%)	40 (78.4%)	50.07	0.001
19-30 month	45 (91.8%)	4 (8.2%)		

χ^2 , Fisher Exact test; Probability value(p value)

Table4. Predictors of pulmonary functions affection between participants.

	Univariate analysis			*Multivariate analysis*		
Variables	***Odds ratio***	***95% CI***	***p-value***	***Odds ratio***	***95% CI***	***p-value***
BMI			0.003			0.007
Normal	Reference					
Overweight	11.15	2.35-52.94	0.002	28.55	2.74-297.84	0.005
Obese	25.67	3.63-181.44	0.001	88.67	5.11-1538.88	0.002
Sex						0.09
Males	Reference					
Females	2.6	1.01-6.15	0.03			
Profession			0.06			
Physician	Reference					
Nurses	0.65	0.65-4.16	0.29			
Physiotherapist	3.81	1.28-11.35	0.02			
Work period						
12- 18 month	Reference					
19-30 month	40.91	12.06-138.71	0.001	73.17	14.24-376.01	0.001

confidence interval (CI); Probability value (p value).

The study designed for investigate the prevalence of the long-lasting effect of covid-19 viral load one year after closure of isolation units in isolation hospitals on medical staff.

There was significant association of risk factors following COVID-19 and pulmonary functions affection. The prevalence of pulmonary function increased in subjects who were overweight, female, working physical therapasits, and working for more than 19 month in contaminated area.

Frontline healthcare workers are highly at risk for pulmonary fibrosis due to their significant exposure to COVID-19, daily direct patient interactions, and COVID-19-related fatalities, within a year, the majority of HCWs who survived, mainly the female HCWs, continued to exhibit abnormal diffusion capacity . Surviving healthcare workers' physical functions were significantly worse to those of the normal population [11].

The finding of the presented study and consisted to Naguen et al., front-line HCWs more susceptible of getting SARS-CoV-2 infection compared with general public [12].

Also Peters et al. Age, high body mass index, and female gender have been determined to be the main risk factors for persistent symptoms [13].

According to Tarrso et al., 39.8% of patients had reduced lung diffusion, regardless of severity a year after COVID-19. [14].

The six-minute walk test and pulmonary function tests are helpful diagnostic methods for long-term COVID-19 pneumonia complications According to Chaiwong et al., Forced vital capacity (FVC) and forced expiratory volume in the first second (FEV1) were significantly lower in post-COVID-19 pneumonia patients at month nine compared to healthy controls. Every time they visited, the six-minute walk distance (6-MWD) of the patients with COVID-19 pneumonia was significantly less than that of the healthy controls[15].

The main COVID-19-related symptoms that reduced quality of life after a year from an acute COVID-19 infection were neuropsychiatric disorders [19].

One of the accepted explanation regarding the long lasting effect of COVID-19 often improves with time, neuropsychiatric symptoms are more common and can last up to 24 months following an acute infection [20]. The study of servier et al., disagree with the current study about The majority of people with post-COVID-19 conditions improve gradually over time, however 4% have a permanent condition and 5% show fast improvement within the first two years of symptom start [21].

There is Female sex, older age, higher body mass index, smoking, preexisting comorbidities, and prior hospitalization or ICU admission were found to be risk factors significantly associated with developing post-covid condition (pcc-), according to a systematic review and meta-analysis of 41 studies involving 860 783 patients. When compared to adult patients under 40 years old, we discovered that patients in both of the older groups had a much higher risk of PCC [22].

The current study had no correlation with age of the tsampasian et al,. .

Lung perfusion capacity was the most impaired lung function indicator (34% with diffusion capacity for carbon monoxide-single breath <80%) [16].

According to Drs. Lammas and Connors, low oxygen levels created on by a severe case of COVID-19 may have some lasting effects. "In COVID-19 patients, these blood clots can appear in the small vessels inside the lungs and heart as well as in the bigger pulmonary arteries and large veins in the legs," said Dr. Connors. The clots may cause scarring in the lungs, which could impair blood flow and reduce lung capacity [17].

It was also proved that Exercise capacity and diffusion capacity are both significantly impaired in post covid condition [18].

CONCLUSION

There was affection on pulmonary functions in medical staff of isolation hospitals in relation to BMI, sex & professions.

Limitation of the study :-

We don’t do CT chest to participants.

There is pulmonary device better than portable spiromrter .

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