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RESEARCH ARTICLE

PERSISTENCE OF SYMPTOMS AFTER COVID INFECTIONAMONG HEALTHCARE PROFESSIONALS: A CROSS SECTIONAL STUDY

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Abstract

Introduction: The symptomatology associated with covid-19 infection has been well described throughout the literature, however little data exists on the persistence of symptoms post the initialrecovery.

Material and method: This is a descriptive cross-sectional observational study whose objectives were to determine the prevalence of persistent symptoms and to evaluate the quality-of-lifeamong health professionals diagnosedwith covid-19 in the Souss Massa region in September 2021.

Results: One hundred and eighty-three healthcare professionals were included in the study, 123 (67%) of whom were women. The mean age was 35 ± 11 years with a range of 22 to 60 years. The main comorbidities were obesity, asthma and dysthyroidism. Participants with covid-19 infection were symptomatic 82% (152 cases) of the time and were evaluated on average 40 days after the onset of the first symptom. At the time of evaluation, 30% (54 cases) were completely cured, however 70% (129 cases) of participants maintained at least one chronic symptom. Of these symptoms, 59% (108 cases) reported fatigue, 28.4% (52 cases) cough, 18.6% (34 cases) headache and 22% (40 cases) anosmia. In addition, a decrease in quality of life was observed among 29% (53 cases) of the participants.

Conclusion: Covid-19 can lead to prolonged illness and persistent symptoms, even among young adults and individuals with no or few comorbidities who have not been hospitalized. The persistence of symptoms impacts one's quality of life, both physically and mentally, which supports the need for regular assessment and monitoring of individuals post covid-19 recovery.

Introduction:-

Covid-19 is an infection caused by the severe acute respiratory syndrome of SARS-cov-2 virus. This disease has spread rapidly around the world and is responsible for a pandemic declared by the World Health Organization (WHO) in March 2020. **[1]**

Clinical signs during the acute phase have been well described throughout the literature, ranging from mild general symptoms to respiratory distress requiring intensive care hospitalization. **[2, 3]**

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The duration of recovery varies from individual to individual, according to the WHO, ten days is sufficient for recovery. However, some patients remain symptomatic for weeks or months after the initial recovery. **[4]**

Recently, the National Institutes of Health (NIH) launched the RECOVER initiative to study tens of thousands of covid-19 survivors in order to understand pathophysiological mechanisms, evaluate therapeutic management and seek preventive means**.[5]**

Similarly, the National Institute for Health and Care Excellence (NICE) published guidance for clinicians on the management and care of people with long-term effects of covid-19. Two definitions have been developed: "ongoing symptomatic covid-19" for people who still have symptoms between 4 and 12 weeks after the start of acute symptoms; and"post-COVID-19 syndrome" for people who still have symptoms for more than 12 weeks after the start of acute symptoms.**[6]**

Although standardized case definitions are being developed, long covid can be considered a lack of return to a usual state of health after an acute covid-19 illness. It may include new or recurrent symptoms that occur after the symptoms of the acute illness have resolved.

Given the limited data on "long covid" syndrome in Morocco, our study was conducted among health care workers who tested positive on PCR demonstrating an active infection with covid-19. The objectives of the study were to determine the prevalence of persistent symptoms and to evaluate the quality of life after the initial covid-19 recovery among health care professionals in Morocco.

Material And Methods:

This is a cross-sectional observational study with a descriptive aim. Inclusion criteria were prior diagnosis of covid-19among health professionals of the Souss Massa region. The data collection was done by a web questionnaire, which was validated by the authors. The questionnaire was made on Google Forms and sent to groups of health professionals via social networks. We asked them to share it with other medical providers to constitute a snowballed sampling. Prior to sharing the link for the online questionnaire, an informed consent was sent to participants.Thisconsentexplained the purpose and nature of the study. All data collected was anonymous, so the identity of the respondent could not be determined. This online questionnairesought information regardingparticipantmedical history, symptoms during and post covid-19 infection as well as assessment of quality of life after covid-19 infection.

Symptom persistence was defined as the presence of at least one symptom four weeks after the first acute symptom and the gravity was defined by hospitalization in ICU. Quality of life assessment was done by the EQ5D 5l scale and then by visual analog scale of the same questionnaire developed by EuroQol, which is validated in French.**[7]**Participants were asked to rate their quality of life from 0 (worst imaginable health) to 100 (best imaginable health) before covid-19 and at the time of data collection. A decrease in quality of life, when comparing quality prior to and after covid-19 infection, was signifiedby a 10-point decrease demonstrated by a visual analog scale.

Statistical analysis

The statistical analysis was done with Jamovi software. **[8,9]**The categorical variables were described by counts and percentages and compared with chi-squaretest and fisher exact for independent samples (according to the conditions of application of each test).

To compare qualitative variables on a paired sample we used the Mcnemar test. To judge the distribution of the quantitative variables, a Shapiro-Wilk test was used. Quantitative variables with a non-Gaussian distribution were described in medians and interquartile ranges and compared with Mann Whitney test for independent samples or Wilcoxon for paired samples. The significance level used was $p \leq 0.05$.

In order to determine potential factors associated with the persistence of covid, a binary logistic regression multivariate analysis was performed.Parameters with a p value ≤ 0.07 were introduced in the model for univariate analysis.

Results:

A total of 183 medical providers were included in the study, of whom 123 (67%) were women. The mean age was 35 years (SD, 11.4) with a range of 22 to 60 years. The main comorbidities found in our population were obesity (9.3%), asthma (7.7%) and dysthyroidism (6%). The infection was symptomatic in 150 cases (82%), of which 108 (72%) had presented more than four symptoms in the acute phase.

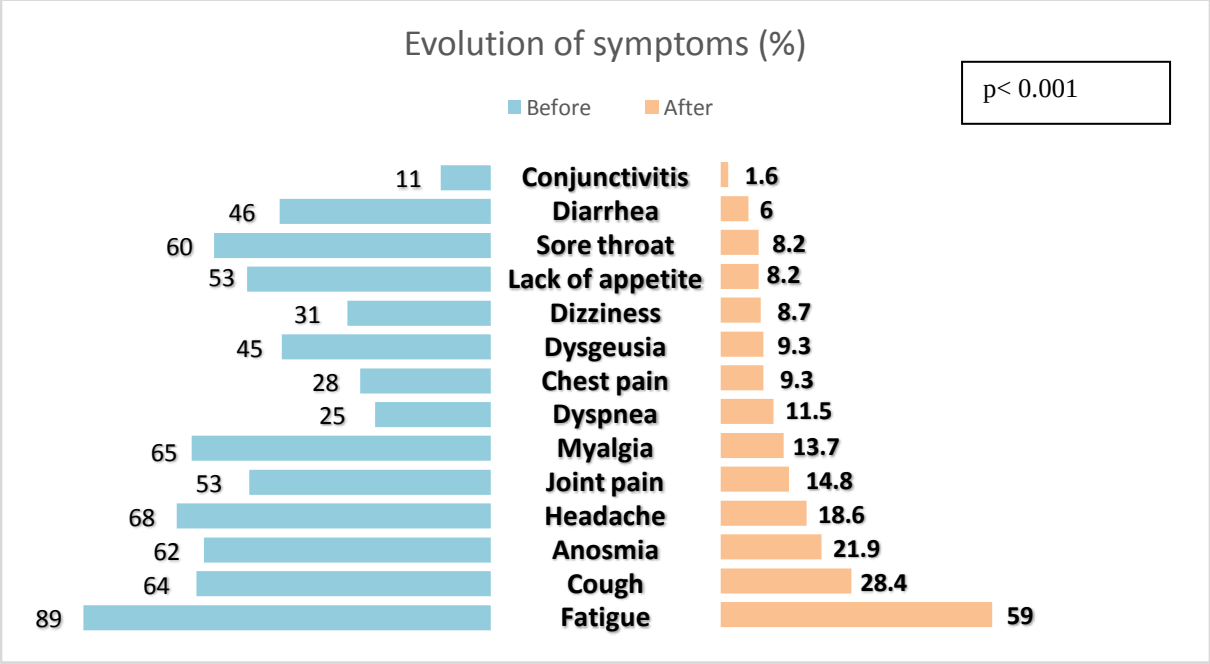
During the acute phase, 13 medical providers (7.1%) were hospitalized. Among these,11 (6%) required oxygen therapy and two (1.1%) required non-invasive ventilation. The different characteristics of the study population are summarized in Table 1.

Table 1:- Demographic and clinical characteristics of the study population .

Variables	Whole	Long Covid		
		Yes	**No**	**p value**
Age by years: median [IQR]	**32 [25-43]**	**32 [26-44]**	**32[24-42]**	**0.710**
Sex :(%)				
Male	**60 (33)**	**29 (31.2)**	**31 (34.8)**	**0.601**
Female	**123 (67)**	**65 (68.8)**	**58 (65.2)**	
Body mass index: (%)				
Normal	**110 (60,4)**	**62 (66.7)**	**48 (53.9)**	**0.079**
Over-weight/Obese	**72 (39,5)**	**31 (33.3)**	**41 (46.1)**	
History (%)				
Diabetes	**8 (4,4)**	**2 (2.1)**	**6 (6.7)**	**0.160**
HTN	**5 (2,7)**	**0**	**5 (5.6)**	**0.026**
Heart disease	**2 (1,1)**	**0**	**2**	**0.235**
Asthma	**14 (7,7)**	**4**	**10**	**0.076**
Dysthyroidism	**11 (6)**	**5**	**6**	**0.686**
Tumor Pathology	**4 (2,2)**	**4**	**0**	**0.121**
Vascular disease	**3 (1,6)**	**2**	**1**	**0.593**
Renal insufficiency	**0**	-	-	-
COPD	**0**	-	-	-
Symptoms in acute phase				
Number of symptoms mean [SD]	**7[5-9]**	**8[6-9]**	**7[4-9]**	**0.026**
Treatment: (%)				
Hospitalization (gravity)	**13 (7,1)**	**11**	**2**	**0.048**
Oxygen therapy	**11 (6)**			
Non-invasive ventilation	**2 (1,1)**			
Mechanical ventilation	**0**	-	-	
Azithromycin	**145 (79,2)**	-	-	
Hydroxychloroquine	**28 (15,3)**	-	-	
Antibiotic therapy	**70 (38,3)**	-	-	
Antiviral	**5 (2,7)**	-	-	
Anticoagulation	**54 (29,5)**	-	-	
Vitamin therapy	**156 (85,2)**	-	-	
EuroQol scoring: median [IQR]				
Usual activities	**1[1-2]**	**1[1-2]**	**1[1-1]**	**0.024**
Mobility	**1[1-1.5]**	**1[1-2]**	**1[1-1]**	**0.404**
Personal care	**1[1-1]**	**1[1-1]**	**1[1-1]**	**0.445**
Pain/discomfort	**1[1-2]**	**2[1-2]**	**1[1-2]**	**0.016**
Anxiety	**1(1-2]**	**1.5 [1-2]**	**1[1-2]**	**0.148**
Visual Analog Scale				
Before infection	**90[80-100]**	**90[85-100]**	**90[80-100]**	**0.913**
After infection	**80[70-95]**	**80[70-90]**	**90[70-97]**	**0.495**

Participants were assessed on average 40 days after the onset of the first covid-19 symptom, at the time of assessment only 39 were completely free of covid-19 related symptoms, while the remaining participants still reported fatigue (59%), cough (28.4%), dyspnea (21%) and chest pain (9.3%). The persistence of symptoms was presented in 129 (70%) of the participants. The various symptoms reported by participants are summarized in Table 2.

Table 2:- Evolution of symptoms after and before covid-19 infection.



A decrease in quality of life was experienced among 53 (29%) of the health care providers.This value was obtained by analyzing the visual analog scale of the EQ5D 5l score.

Multivariate analysis assessing for risk factors in our population revealed that a greater risk for persistent chronic symptoms existedamong those withmore than four symptomsdescribed in the acute phase(Table 3).

Table 3:- Risk factors for post-acute sequelae of covid-19.

	Odds ratio adjusted	95 % confidence Interval		p value
		Lower	Upper	
BMI< 25 Yes - No	1.713	0.8968	3.272	0.103
Asthma Yes - No	3.400	0.9312	12.413	0.064
HTN No - Yes	8.9×10^{-8}	0.0000	Inf	0.987
Symptoms> 4 Yes - No	**2.996**	**1.4611**	**6.145**	**0.003**
Gravity Yes - No	3.159	0.9311	10.720	0.065

Discussion:-

The pathophysiology of long covid is not well known. Various hypotheses have been offered.The main hypothesis currently presented in the literatureis that the immunogenic response to the viral load produces an inadequate state of chronic hyperinflammation and that this state is contributing to organ damage.**[10]** The systemic aspects of long covid, as well as the psychosocial impacts, are likely responsible for the observeddecrease in reported quality of life. **[11]**

Published data portraying the proportion of patients impacted by long covid varies from study to study. These observed differences are likely impacted by the parameters being used to define long covid.Despite this, several studies, including ours, have shown high rates of persistent symptomsbeyondfour weeks, impacting up to 70% of patients. **[12, 13]**Otherstudies have demonstrated that at least 10% of patients have chronic symptoms. **[14]**

Given the diversity of symptoms of covid during the acute phase, several symptoms were also described during the chronic phase. Two cohort studies including 1733 and 538 patients reported that fatigue, dyspnea and insomnia were the most common symptoms. **[16,17]** A recent systematic review found that fatigue, dyspnea and anxiety were the most frequently reported symptoms.**[15]**In contrast, in our study, fatigue, cough and anosmia were the most often described symptoms.

The identification of individuals at risk of developing long covid is difficult. Several factors have been suggested; the primary one being the severity of the acuteillness period.**[16]** According to Sudre et al, advanced age, female gender, obesity and the presence of more than five symptoms during the acute phase is associated with an increased risk of developing long covid. **[18]** Tosato et al, showed that advanced age and the presence of more than one symptom during the acute phase is associated with a higher risk of having persistent symptoms more than two months after hospital discharge**.[19]**In contrast, our study revealed that the presence of more than four symptoms in the acute phase was a risk factor for the persistence of symptoms. The variation among theseresults demonstrates the diversity on risk factorspublished in the literature.

Despitedata demonstrating that the number of symptoms decreases significantly over time ($p \leq 0.001$), there is no indication on the time required for full recovery. **[20, 21]**

The burden of long covid was demonstrated in our study by its impact on one's quality of life ($p \leq 0.05$). This is similar to observations made in other studies assessing the quality of life among survivors of acute respiratory distress syndrome secondary to SARS-COV-2, influenza A (H1N1) and other coronavirus diseases.**[22-25]**

This study demonstrated the increased prevalence of persistent symptoms and associated decrease in quality of lifeamonghealth care providers after SARS-CoV-2 infection. These results suggest that monitoring and follow-up protocols should be put in place in order to reduce the impact of these symptoms on the physical and mental healthamongmedical providers.

Limitation of our study:

Our study is monocentric and was conducted among health care providers during a phase of work overload (the pandemic); we did not perform an exhaustive workup in search of alternate pathologies responsible for the described symptoms.

Declaration of interest:

No conflict of interest is declared by authors.

Conclusion:-

Covid-19 can lead to prolonged illness and persistent symptoms, even among young adults and individuals with no or few comorbidities who have not been hospitalized. These persistent symptoms impact one's quality of life, including both mental and physical health, which supports the need for regular assessment and monitoring of individuals post the initial covid-19 recovery.

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