Original Article

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Impact of Post-acute COVID-19 Syndrome on Mental Health of Healthcare Professionals: A Cross-sectional Study

Physiotherapy Section

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ABSTRACT

Introduction: Anxiety, depression, and poor sleep quality are the most common mental health issues in post-acute Coronavirus Disease-2019 (COVID-19) syndrome. Healthcare Professionals (HCPs) were overburdened and unable to focus on their own health issues. Previous epidemic diseases, such as Severe Acute Respiratory Syndrome (SARS) in 2003, also accompanied psychiatric issues in HCPs. In light of this, the purpose of this study was to identify the symptoms of COVID-19 that continue to affect HCPs and their associations with fatigue, poor sleep, anxiety, depression, and activity levels, in order to provide better care and treatment for them.

Aim: To analyse the impact of post-acute COVID-19 syndrome on the mental health of HCPs and compare the results with non COVID-19 infected participants.

Materials and Methods: A cross-sectional study was conducted at PGIMS, Rohtak in Haryana, India from October 2021 to September 2022. A total of 280 participants between 25-45 years of age, including doctors, nurses, and dentists involved in direct COVID-19 patient care, were included in the survey. They were divided equally into a non COVID-19 infected group and a post-acute COVID-19 syndrome group, with atleast three months having passed since infection. The survey included scales addressing anxiety, depression, and sleep quality, including the Zung Self-rating Anxiety Scale (SAS), Zung Self-rating Depression Scale (SDS), and Pittsburgh Sleep Quality Index (PSQI). The mean scores were compared between both groups using an Independent sample t-test.

Results: The data of 240 participants were analysed and compared between both groups. The mean age was 32.41 years in the post-acute COVID-19 syndrome group and 31.24 years in the non COVID-19 infected group. The post-acute COVID-19 syndrome group consisted of a large proportion of doctors (60, 42.9%) and nurses (53, 37.9%), whereas the non COVID-19 infected group included doctors (47, 33.5%) and nurses (56, 40%). The results showed statistically significant differences for anxiety (p-value=0.001) and sleep quality (p-value=0.001), while no significant differences were found for depression (p-value >0.05).

Conclusion: Anxiety and poorer sleep quality occur in healthcare workers suffering from post-acute COVID-19 syndrome. Creating multidisciplinary rehabilitation health teams in hospitals with clinician psychologists, physiotherapists, nurses, and psychiatrists is essential to address mental health issues in the post-COVID-19 population.

Keywords: Depression, Epidemic diseases, Fatigue, Sleep disorders

INTRODUCTION

A sound mental state is the cornerstone of good health. Currently, the global burden of illness may be topped by mental and psychological conditions. It is necessary to take note of the mental health issues that have arisen after COVID-19. The ongoing psychological crisis in the public following the SARS infection has raised concerns for the public's mental and psychological health in the post-COVID-19 future [1]. It was previously anticipated that COVID-19 might affect the general public's health in psychological, social, and neuroscientific dimensions, just like during previous epidemics of SARS in 2003, Influenza A in 2009, and Ebola in 2014 [2]. In fact, COVID-19 caused a high incidence of mental health disorders such as acute stress, post-traumatic stress disorder, anxiety, depression, irritability, insomnia, and decreased attention directly or indirectly in the general population [3].

The HCPs are at risk for a variety of adverse well-being outcomes as COVID-19 continues to have an influence on society globally and due to their role as caregivers [4]. Evidence from earlier virus outbreaks and early COVID-19 pandemic findings emphasised the psychological toll on HCPs. Previous studies have shown prevalence estimates for depression (21.7%) and anxiety (22.1%) among healthcare workers during the COVID-19 pandemic [5,6]. The tedious process of providing care for patients with COVID-19 while managing significant issues on a daily basis, such as lack of hospital facilities, personal protection measures, exhausting working hours, fear of contagion, and spreading the virus, make them more vulnerable to mental breakdowns. Uncertainties about the features of the viruses, lack of therapies, their rapid spread, and lack of protective equipment also produced a significant amount of stress that led to frequent health conditions [3]. Epidemic diseases, such as SARS in 2003, also accompanied multiple psychiatric morbidities in HCPs [7]. For the purpose of directing prevention and treatment efforts, one strategy is to investigate the impacts of post-acute COVID-19 syndrome in HCPs who were at risk for the virus. To do this, thorough estimates of mental health problems among these individuals during the COVID-19 pandemic are needed [8].

HCPs were overburdened with work during and after the pandemic and were unable to focus on their own health issues or seek any kind of medical advice. Therefore, they were more prone to have several mental health issues [9]. The aim of the present study was to determine if the COVID-19 pandemic or the effects of post-acute COVID-19 on HCPs' mental health are to blame by comparing results with non COVID-19 infected participants, which will assist the HCPs who are still coping with mental health problems related to COVID-19.

MATERIALS AND METHODS

The present cross-sectional study was conducted at a tertiary hospital in Rohtak, Haryana, India from October 2021 to September 2022 and included 280 HCPs. The study was ethically approved

by the Biomedical Research Ethics Committee Pt. BD Sharma Post Graduate Institute of Medical Sciences, UHS, Rohtak (EC/NEW/INST/2020/874, dated 06/10/2021). Informed consent was obtained before data collection, with the consent form provided in both Hindi and English.

Inclusion criteria: Age between 25-45 years, medical doctors, dental professionals, or nursing professionals and more than three months must have passed since COVID-19 infection (in the COVID-19 infected group) and those who were involved in direct COVID-19 patient care were included in the study.

Exclusion criteria: Any pre-existing physical or mental impairments, admission to the intensive care unit after contracting COVID-19 were excluded from the study.

Sample size: A study by Gaber TAK et al., observed a prevalence of COVID-19 of 24% among HCPs [9]. Using this value as a reference, the minimum sample size with a 5% level of significance was determined to be 280 subjects. Hence, approximately 280 HCPs were included in the study. The formula used for sample size calculation was as follows:

$$N=(1-\alpha/2)^2 \times p(1-p)/d^2 \text{ where } Z\ (1-\alpha/2)^2$$

is the standard normal variate (at 5%, it is 1.96), p is the expected proportion in the population based on previous studies (approximately 24%), and d is the absolute error in precision for the current study. The participants were conveniently divided into post-acute COVID-19 syndrome infected and non COVID-19 infected groups, with 140 participants in each group.

Study Procedure

Demographic details of patients were collected, including gender, age, occupation, and locality. Patients' height and weight were measured in centimeters and recorded for anthropometric purposes. Body Mass Index (BMI) was also calculated.

General health inquiries included the following questions: Have any members of your family contracted the disease? What symptoms did you experience during the acute phase? Were you vaccinated? Have you ever been on call or asked to work on the treatment of COVID-19? Participants were also asked about any diagnosed co-morbidities and the date of the positive COVID-19 test result.

Anxiety was measured using the Zung SAS [10,11], which is a free-to-use 20-item self-report assessment scale. It is based on scoring in four groups of manifestations: cognitive, autonomic, motor, and central nervous system symptoms. The questions included statements such as "I feel more nervous and anxious than usual" or "I feel that everything is all right and nothing bad will happen." Participants indicated how much each statement applied to them within a period of one month prior to taking the test. Each question was scored on a Likert-type scale of 1-4, corresponding to "a little of the time," "some of the time," "good part of the time," and "most of the time." The overall assessment was done by calculating the total score. The total raw scores ranged from 20-80. The raw score was then converted to an "Anxiety Index" score (range 25-100) using the chart provided by Zung in the paper version of the test, which included a raw score-index score conversion table. A standard score ≥50 indicated 'psychological anxiety'. Mean standard scores were also used for analysis in the study [10].

Sleep quality was measured using the PSQI [12], a self-administered questionnaire that included four open-ended questions and 14 other questions answered using event-frequency and semantic scales. The participants completed the PSQI independently and rated their overall sleep quality on a semantic scale ranging from "very good" to "very bad." The PSQI included a scoring key for calculating seven subscores, each ranging from 0 to 3. These subscores were then summed to give a "global" score that can range from 0 to 21. A global score of 5 or more indicated poor sleep quality, so the higher the score, the worse the sleep quality. Mean global scores of the participants were used in present study to compare significance between groups and for further analysis [12,13].

Depression was assessed using the SDS, which is a free-to-use short self-administered survey to quantify a patient's depressed status [10]. The scale consisted of 20 items that rated the four common characteristics of depression: the pervasive effect, physiological equivalents, other disturbances, and psychomotor activities. The items included 10 positively worded and 10 negatively worded questions (such as "I have trouble sleeping at night" or "I am restless and can't keep still"). Each question was scored on a scale of 1-4, corresponding to "a little of the time," "some of the time," "good part of the time," and "most of the time." The raw data was then converted to an SDS Index Score, where a cut-off standard score for depression is 50. The higher the score, the more likely one was to be depressed. Mean standard scores were analysed in the study [10].

STATISTICAL ANALYSIS

The acquired data were statistically analysed using Statistical Package for the Social Sciences (SPSS) version 21.0. The mean and Standard Deviation (SD) were used to calculate the continuous variables (age, BMI), while frequency distribution was used to calculate the categorical variables in descriptive statistics (gender, designation). The independent sample t-test was used to compare two groups for anxiety, sleep quality, and depression. A p-value <0.05 was considered significant.

RESULTS

Out of the 280 HCPs included in the study, 140 had a confirmed diagnosis of COVID-19 infection by a Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) test during the acute sickness. The demographic information presented in [Table/Fig-1] revealed that there was no statistically significant difference in age between the two groups (p-value=0.11), with a mean age of 32.41 years in the post-acute COVID-19 syndrome group and 31.24 in the non COVID-19 infected group. There were more females in the study, with 85 (60.7%) and 104 (74.3%) females in the post-acute COVID-19 syndrome group and non COVID-19 infected

Variables	Values	Post-acute COVID-19 syndrome		Non COVID-19 infected		Significance		
		n (%)	Mean±SD	n (%)	Mean±SD	χ^2-value	t-value	p-value
Age (years)			32.41±6.23		31.24±5.90		1.604	0.11
Gender	Male	55 (39.3)	-	36 (25.7)	-	5.877	-	0.015**
	Female	85 (60.7)		104 (74.3)		-		-
BMI			24.68±2.93		23.67±7.10		2.60	0.01**
Occupation	Doctor	60 (42.9)	-	47 (33.5)	-	3.225	-	0.19
	Nurses	53 (37.9)		56 (40)		-		-
	Dentist	27 (19.2)		37 (26.5)				

[Table/Fig-1]: Demographic data of participants in both groups.
p-value is calculated with Chi-square test for gender and designation and t-test for age and BMI
BMI: Body mass Index
*p<0.05, **p<0.01, n=Number of participants

group, respectively. The mean BMI was in the normal range, with a mean of 24.68 in the COVID-19 infected group and 23.67 in the non COVID-19 infected group. A large proportion of doctors, nurses, and dentists were found in both the post-acute COVID-19 syndrome group (60 [42.8%], 53 [37.8%], 27 [19.2%]) and the non COVID-19 infected group (47 [33.5%], 56 [40%], 37 [26.5%]). Both groups were matched for age and designation, and there was no statistically significant difference in age and designation between the groups (all p-value >0.05).

The responses to general health questions, as provided in [Table/Fig-2], found that 73 (52.2%) subjects' family members contracted COVID-19 in the post-acute COVID-19 syndrome group, compared to 34 (24.2%) in the non COVID-19 infected group. There was a higher percentage of symptomatic subjects in the post-acute COVID-19 syndrome group, with 89 (63.6%) reporting symptoms at the time of illness. Both groups had a high percentage of vaccinated subjects, with 135 (96.4%) in the post-acute COVID-19 syndrome group and 127 (90.7%) in the non COVID-19 infected group. All participants in both groups were involved in direct contact with COVID-19 infected patients and performed COVID-19 duties. A large proportion of participants in both groups did not have any co-morbidity, with 126 (90%) in the post-acute COVID-19 syndrome group and 121 (86.4%) in the non COVID-19 infected group.

Queries	Response	Post-acute COVID-19 syndrome n (%)	Non COVID-19 infected n (%)
Family member infected?	Yes	73 (52.1)	34 (24.3)
	No	67 (47.9)	106 (75.7)
Symptoms present at the time of illness in post-acute COVID-19 syndrome group	Symptomatic	89 (63.6)	
	Asymptomatic	51 (36.4)	
Vaccination status	Vaccinated	135 (96.4)	127 (90.7)
	Not vaccinated	05 (3.6)	13 (9.3)
COVID-19 duties	Yes	140	140
	No	0	0
Co-morbidities	Absent	126 (90)	121 (86.4)
	Present	14 (10)	19 (13.6)

[Table/Fig-2]: Distribution of responses of general health queries of participants in both groups.
n=Number of participants; %=Percentage

The mean comparison between the post-acute COVID-19 syndrome group and the non COVID-19 infected group, as observed with independent sample t-test, showed statistically significant differences for anxiety (p-value=0.001) [Table/Fig-3]. There were no statistically significant differences between the groups for depression, as seen with independent sample t-test (p-value=0.46) [Table/Fig-4]. An independent sample t-test revealed a statistically significant difference between the groups for sleep quality (p-value=0.001) [Table/Fig-5].

Variable	Non COVID-19 infected n (140) Mean±SD	Post-acute COVID-19 syndrome n (140) Mean±SD	t-value	p-value
Anxiety	36.09±6.74	45.90±9.52	9.93	0.001**

[Table/Fig-3]: Comparison of anxiety between post-acute COVID-19 syndrome group and non COVID-19 infected group.
t value and p-value are calculated with independent sample t-test
*p<0.05, **p<0.01, n=Number of participants

Variable	Non COVID-19 infected n (140) Mean±SD	Post-acute COVID-19 syndrome n (140) Mean±SD	t-value	p-value
Depression	42.47±8.72	43.23±8.69	0.72	0.46

[Table/Fig-4]: Comparison of depression between post-acute COVID-19 syndrome group and non COVID-19 infected group.
t-value and p-value are calculated with independent sample t-test
*p<0.05, **p<0.01, n=Number of participants

Variable	Non COVID-19 infected n (140) Mean±SD	Post-acute COVID-19 syndrome n (140) Mean±SD	t-value	p-value
Sleep quality	3.45±2.06	5.01±3.37	4.67	0.00**

[Table/Fig-5]: Comparison of sleep quality between post-acute COVID-19 syndrome and non COVID-19 infected group.
t-value and p-value are calculated with independent sample t-test
*p<0.05, **p<0.01, n=Number of participants

DISCUSSION

The impact of COVID-19 continues to be a concern for individuals and the public, even after recovery. The present study aimed to examine the post-COVID-19 impact on mental health among HCPs by comparing anxiety, depression, and sleep quality between COVID-19 infected and non COVID-19 infected participants who were matched for age and designation. The current study included a higher percentage of female HCPs, with 60.7% in the COVID-19 infected group and 74.3% in the non COVID-19 infected group, compared to males. Previous data has indicated that COVID-19 appears to affect men more severely than women, with men having a 60-80% higher mortality rate than women [14,15]. Nurses constituted the majority of the study sample, accounting for 37.9% in the COVID-19 infected group and 40% in the non COVID-19 infected group. These results were consistent with previous studies by Barrett ES et al., and Gómez-Ochoa SA et al., where nurses were found to be the most frequently affected personnel by COVID-19 among HCPs, with percentages of 62.5% and 48%, respectively [16,17].

According to the findings of the present study, participants who were infected with COVID-19 experienced higher levels of anxiety than those who were not infected. The study discovered highly significant differences in anxiety between the post-acute COVID-19 syndrome group and the non COVID-19 infected group of healthcare professionals (p-value <0.05). These results were not unexpected, given the significant psychological pressure that public health emergencies place on healthcare workers. The reasons for these outcomes may be personal, such as concerns about the possibility of infection for themselves or their family members, the need to wear masks and avoid social contact, or uncertainty about the future [18,19].

However, very few studies have examined anxiety as a potential long-term effect of COVID-19; most have focused more on anxiety associated with the fear of the pandemic. The COVID-19 virus can effectively infiltrate the central nervous system, leading to the hypothesis that anxiety might develop over time as a result of COVID-19 infection [20,21]. The findings of the present study align with previous corona outbreaks, such as SARS and MERS, where patients exhibited post-infection anxiety linked to elevated levels of IL-1 and IL-6, indicating activation of T-helper-1 cell function [22]. Additionally, higher levels of T-helper-2 cell-secreted cytokines, such as IL-4 and IL-10, were discovered in COVID-19 compared to SARS and MERS. These higher levels of cytokines appeared to indicate a more severe clinical course [23]. Psychiatric diseases have been associated with cytokine dysregulation, particularly in the case of IL-1, IL-6, IL-10, interferons, tumour necrotic factor, and transforming growth factor [24-26].

However, the results did not reveal any statistically significant difference (p-value >0.05) between the COVID-19 and non COVID-19 infected groups regarding depression. This finding was inconsistent with most existing studies. Most studies measured the frequency of depressive symptoms and clinically significant depression six or more months after diagnosis or hospital discharge, and reported a frequency of 27% for moderate depressive symptoms and 5% for severe depressive symptoms. However, these studies did not include a control group (i.e., individuals not exposed to SARS-CoV-2) and did not evaluate the long-term changes in mental health and depression [27,28]. These studies also failed to explain whether the high frequency of depression

among individuals with post-COVID-19 syndrome is a long-term consequence of the viral infection or a result of the social and/or economic outcomes of the pandemic [29].

Nevertheless, it cannot be concluded that depression was more frequent in patients suffering from post-COVID-19 syndrome than in the general population [30]. This gap was addressed in the current study, where a matched control group was assessed and showed no significant differences in depression between the groups.

The results suggest that participants infected with COVID-19 experience sleep disturbances and poorer sleep quality compared to non infected participants. The current study found highly significant differences (p-value <0.05) in sleep quality between the COVID-19 infected and non infected groups. Sleep problems are frequently reported symptoms in COVID-19, with a rate of 23% [31]. These sleep disturbances often persist upto a year following a serious illness, particularly after intensive care [32]. The observed decrease in sleep quality and disrupted sleep patterns could be related to the use of medications for recovery. Additionally, being in isolation or quarantine may not provide the ideal environment for maintaining regular sleep patterns. It is difficult to determine whether the poor sleep quality is a result of the severe infection and/or its medical treatment, or if it is a symptom of pre-existing sleep disorders due to the lack of baseline data before infection [33].

According to Jahrami et al., 74.8% of patients with COVID-19 during the pandemic were diagnosed with dyssomnia, while sleep disorders affected 35.7% of the population [34]. In the present comparison-based study on HCP, the mean PSQI (Pittsburgh Sleep Quality Index) was higher in the COVID-19 infected group, indicating poorer sleep quality (5.01 vs. 3.45). Similar results were shown by Wang et al., who found that 38% of healthcare workers in their study suffered from sleep disturbances, significantly higher than the general population with a mean PSQI of 7.22 [11]. Other authors have also evaluated the prevalence of sleep disturbances in medical professionals and found a 36% prevalence, similar to the general population [35]. One possible explanation for the altered sleep quality in healthcare workers post COVID-19 could be their prior exposure to epidemics, which often resulted in quarantine. HCP are under significant pressure during epidemics, with one out of every six nurses displaying signs of stress and worry. Other reasons for sleep disturbances may include physical discomfort, frequent night time urination, and respiratory distress in individuals with partially closed nasal passages, which can reduce sleep quality [36]. Other studies have highlighted that individuals with sleep difficulties often exhibit stress symptoms more frequently than those in the control group [37,38].

The main strength of the current study was that it evaluated post-COVID-19 symptoms in HCP by comparing them with a matched control group.

Limitation(s)

The present study also has a few limitations. First, it was an observational study, so casual relationships cannot be inferred. Second, since the subjects self-reported their outcomes, the presence of recall bias might have influenced the findings of the current study. Additionally, personal factors can also contribute to stress and anxiety, which can subsequently impact one's mental health.

CONCLUSION(S)

The COVID-19 outbreak has had varying psychological consequences on healthcare workers. Prompt psychiatric attention is necessary for this population in cases of severe mental illnesses. It is essential to encourage high-risk medical staff to seek psychiatric assistance from professionals and participate in clinical diagnosis and therapy provided by psychiatrists. HCP working in both active and less active units could be included in rotation. Routine screenings should be conducted to assess their levels of anxiety, sadness, and sleep disturbances. To support this staff, it is crucial to develop multidisciplinary rehabilitation health teams in hospitals, including clinical psychologists, physiotherapists, nurses, and psychiatrists.

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