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PSYCHOLOGICAL IMPACT AND FACTORS ASSOCIATED WITH IT IN PATIENTS AFTER SIX MONTHS OF RECOVERY FROM COVID 19.

Psychiatry

Dr. Joel Andrews	DNB Respiratory Medicine, Consultant Pulmonologist, Bluemoon Hospital, Malappuram, Kerala, India
Dr. Nikhil Goel*	Associate Professor And HOD Psychiatry, Shaheed Hasan Khan Mewati Government Medical College, Nuh Haryana, India *Corresponding Author
Dr. Kapil Sharma	Associate Professor Department Of Respiratory Medicine, Shaheed Hasan Khan Mewati Government Medical College, Nuh Haryana, India
Dr. Vipin Goyal	Professor And HOD, Department Of Respiratory Medicine, Shaheed Hasan Khan Mewati Government Medical College, Nuh Haryana, India
Dr. Sapna Singla	Assistant Professor, Department Of Pathology, Shaheed Hasan Khan Mewati Government Medical College, Nuh Haryana, India
Dr. Yuthika Agrawal	Assistant Professor, Department Of Biochemistry, Shaheed Hasan Khan Mewati Government Medical College, Nuh Haryana, India
Dr. Rosmin Mathew	Consultant, Department Of Pediatrics, St. Joseph Hospital Calicut, Kerala, India

ABSTRACT

Background: The long-term serious consequences of COVID-19 extend beyond physical illness, with an increasing presence of post-recovery psychological effects. This study explores the prevalence of depression, anxiety, and stress in patients six months after clinical recovery from COVID-19 and examines the correlation between lung function and psychological outcomes. **Methods:** A cross-sectional study was conducted at a tertiary care institution of North India, involving 100 patients aged 18–70 years who had clinically recovered from COVID-19 at least six months prior. Psychological assessments were carried out using the Depression Anxiety and Stress Scale-21 (DASS-21), and lung function was evaluated through spirometry. Data were analyzed using descriptive and inferential statistics. **Results:** Among the participants, 15% showed symptoms of depression (14% mild, 1% moderate) and 19% reported anxiety (17% mild, 1% severe, 1% extremely severe). No cases of stress were recorded. Spirometry results revealed that 51% had abnormal lung function (28% obstructive, 20% restrictive, 3% mixed). A statistically significant association was observed between anxiety and abnormal spirometry (p=0.001), while no significant correlation was found between spirometry and depression (p=0.449). **Conclusion:** A notable proportion of post-COVID-19 patients exhibit mild to moderate psychological symptoms six months after recovery, with anxiety strongly associated with impaired pulmonary function. These findings underscore the importance of integrating mental health screening and respiratory assessment in post-COVID care protocols to support holistic patient recovery.

KEYWORDS

COVID-19 recovery, psychological impact, anxiety, depression, lung function, spirometry, DASS-21

INTRODUCTION:

Coronavirus Disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in Wuhan, China, in December 2019. What began as an unidentified pneumonia, according to the World Health Organization (WHO) on December 31, 2019, rapidly escalated to a global pandemic by March 11, 2020. COVID-19 can range from being asymptomatic to presenting with a wide array of symptoms, affecting multiple systems including the respiratory, cardiovascular, gastrointestinal and central nervous systems[1].

The global impact of the COVID-19 has been profound, with millions of individuals recovering from the initial infection. However, a significant subset of these survivors continues to experience severe symptoms and organ dysfunction long after the acute phase of the disease has passed[2]. Emerging evidence suggests that these persistent issues may be linked to the cytokine storm that may have occurred during the early stages of infection[3].

Studies on other coronavirus infections, such as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), have demonstrated that elevated pro-inflammatory cytokine responses during the acute phase are correlated with severe lung disease[4].

Unlike its predecessors, COVID-19 presents a more complex clinical picture, extending beyond a mere respiratory illness to involve multiple organ systems[5]. Recent observations have identified residual lung abnormalities and the onset of new psychiatric symptoms, such as anxiety, depression and stress, in patients several months after their discharge from the hospital. This highlights a dual burden of somatic and psychological morbidity associated with COVID-19. Furthermore, historical data from previous epidemics suggest that similar isolation measures used to manage COVID-19 have had detrimental effects on mental health, leading to increased risks of depressive disorders, anxiety, post-traumatic stress disorder (PTSD) and sleep disturbances[6]. Moreover, isolation measures implemented during past pandemics, akin to those employed to manage COVID-19, have been linked to negative psychological effects on both patients and their families [7-10]. Notably, women have been found to be particularly vulnerable to these mental health challenges in the context of COVID-19[11-13].

These patients may be grappling with 'long' or 'chronic' COVID-19 or a variant of post-COVID-19 syndrome. Termed COVID-19 long-haulers, akin to those seen during the influenza pandemic of the 20th century[14], these individuals continue to endure atypical chronic symptoms such as extreme fatigue, shortness of breath, joint pains, brain fog, and mood swings, suggesting an enduring underlying pathology beyond the acute COVID-19 phase[15-17].

There is currently no universally accepted definition of 'long COVID' or 'post-acute COVID-19 syndrome (PACS)'. According to the National Institute for Health and Care Excellence (NICE), it encompasses signs and symptoms that develop during or after an infection consistent with COVID-19, persist for more than 12 weeks and are not explained by an alternative diagnosis[18]. As the world continues to grapple with the aftermath of COVID-19, understanding the psychological impact and associated factors on patients remains crucial for informing clinical practices and policy responses. A proactive approach to mental health care for survivors is essential to foster resilience and enhance quality of life during their journey of recovery.

There is little research in India as well as in many other countries in this field.

Aim And Objectives:

Aim: Assessment of lung functions, depression, anxiety and stress after six months of recovery from COVID-19 in patients attending a tertiary care hospital of Haryana.

Objectives:

- To assess lung functions, depression, anxiety and stress in patients who have recovered from COVID-19 at least six months ago.
- To determine the correlation between lung functions and the Depression Anxiety and Stress Scale (DASS:21) in the study population.

MATERIAL AND METHODS:

Study Design: A cross-sectional study was conducted in adults (18 –70 years) who recovered from COVID 19 disease at least six months ago. The recovery criteria were taken as clinical recovery with symptomatic relief. The present study was conducted in the department of Respiratory Medicine and Psychiatry at a tertiary care institution of North India. Patients for the study were identified from Out Patient Department of the Department of Respiratory Medicine, and further details were taken in Psychiatry Department. Approval for the study was obtained from the institutional ethics committee and written informed consent was obtained from all patients participating in the study.

Study Subjects:

- Patients who attended the Out Patient Department of Respiratory Medicine and who had recovered from COVID-19 at least six months ago.
- Patients who fulfilled inclusion and exclusion criteria.
- First 100 patients who fulfilled the criteria and attended the Out Patient Department after the commencement of the study.

Sample Selection: Patients recovered from COVID-19 were recruited for the study with the following inclusion and exclusion criteria:

Sample Size: The sample size for the study was calculated using the formula [N = Z2 1-α/2 P (1-P)/D2]. Z is the value of area under the normal curve (for two-tailed) and α is the level of significance which is taken as 0.05. 'P' is the prevalence of deviation from physical wellness among COVID-19 recovered patients as reported by an earlier published study44 to be 50.8% and 'D' is the absolute precision (10%). Thus, a sample size of 98 adults aged more than 18 years was derived. It was then rounded off to 100 study subjects.

Study Period: The study period was from August 2022 to August 2024.

Inclusion Criteria:

1. Confirmed cases of COVID-19 who had recovered from the disease at least 6 months ago.
2. Patients aged 18-70 years.
3. Patients who were willing to participate in the study after giving informed consent.

Exclusion Criteria:

1. Patients with coexisting or history of respiratory diseases such as Bronchial asthma, Pulmonary Tuberculosis, Pneumothorax, Lung cancer, Chronic Obstructive Pulmonary Disease.
2. Patients with a history of co-morbidities like Hypertension, Coronary artery disease, Diabetes mellitus etc.
3. Patients with history of neurological diseases, such as advanced dementia, Alzheimer's Disease, Small Vessel Disease etc.
4. Patients who had a history of orthopedic or other surgical operations.
5. Pregnant women.
6. Patients with history of previous psychiatric illness.
7. Patients who were physically too ill or mentally incapacitated to participate in the study.
8. Patients who were NOT willing to participate in the study.

Study Tools

- Self-made, pretested and validated schedule/ data collection tool.
- Spirometry.
- Consent forms in English, Hindi, or local language.

Assessment Of Depression, Anxiety And Stress Was Done In Psychiatry Department -

Depression Anxiety and stress scale 21(DASS:21) [19]

Statistical Analysis:

For statistical analysis, data were entered into a Microsoft Excel spreadsheet and data analysis was performed using Jamovi 2.5.3. The study primarily employed descriptive statistics and inferential statistical tests. For categorical variables, frequencies and percentages were calculated and presented in distribution tables. For continuous variables, means, standard deviations, medians, and interquartile ranges were reported, where appropriate. To examine the correlation between categorical variables chi-square ($\chi 2$) tests were used, with results including the $\chi 2$ value, degrees of freedom (df), and p-value. For comparing physiological parameters between groups independent t-tests were conducted, reporting the t-value and p-value. A p-value of < 0.05 was considered as statistically significant.

RESULTS:

Table 1 Shows Socio Demographic Profile Of All The Patients:

Parameters	Frequency (%)
Age	
≤30	29
31-40	25
41-50	18
51-60	19
>60	9
Total	**100**
Sex	
Female	42
Male	58
Total	**100**
Occupation	
Housewife	27
Unemployed	18
BUSINESS	31
Employed	12
Skilled worker	12
Total	**100**
Education	
Below high school	49
High school	29
Graduate	22
Total	**100**
Marital Status	
Married	82
Unmarried	18
Total	**100**
Religion	
HINDU	33
MUSLIM	67
Total	**100**

Distribution Of The Study Population As Per Age: Out of 100 patients, 29% were in the age group of less than 30 years, 25% were in the age group of 31 to 40 years, 18% were in the age group of 41 to 50 years, 19% were in the age group of 51 to 60 years, and 9% were over 60 years.

The mean age of our study population was 41.3 years, median age 38 years, with SD: 14.2 and IQR 29.3 -53.8 years.

Distribution By Sex: Out of 100 participants, 58% were male and 42% were female.

Distribution According To Occupation: Out of 100 patients, 18% were unemployed, 12% were employed, 27% were housewives, 31% were engaged in business, and 12% were skilled workers.

Distribution According To Educational Status: Out of the study population, 22% were graduates, 29% were high school graduates, and 49% had education below high school.

Distribution According To Marital Status: Out of 100 study population, 18% were unmarried and 82% were married.

Distribution Of The Study Subjects According To Religion: Out of 100 subjects, 33% belonged to Hindu religion and 67% belonged to

Muslim religion.

Table 2 depicts the distribution of the study sample as per the psychological scores (Depression, anxiety and stress) on DASS 21 scale. 85% of the study population had no depression, 14% had mild depression and 1% had moderate depression. It also depicts the distribution of the sample according to the presence of anxiety. 81% of the population had no anxiety, 17% had mild anxiety,1% had severe anxiety and another 1% had extremely severe anxiety. None of the study population had stress as per DASS-21 scale.

Parameters	Frequency
Depression	
Normal	85
Mild	14
Moderate	1
Total	100
Anxiety	
Normal	81
Mild	17
Moderate	0
Severe	1
Extremely severe	1
Total	100
Stress	
Normal	100
Abnormal	0
Total	100

Table 3 depicts the distribution according to spirometry pattern. Out 100 post Covid-19 patients 49% had normal spirometry, 28% had obstructive pattern, 20% had restrictive pattern and 3% had mixed pattern.

Spirometry	Frequency
Mixed pattern	3
NORMAL	49
Obstructive	28
Restrictive	20
Total	100

Table 4 shows the association between anxiety and spirometry. 93.9% (46) patients with normal spirometry had no anxiety and 6.1% (3) had anxiety. 68.6% (35) of those with abnormal spirometry findings had no anxiety and 31.4% (16) had anxiety. There was statistically significant association between anxiety and abnormal spirometry findings (p value -0.001).

Spirometry	Anxiety				Total		χ^2	df	p
	Normal		Abnormal						
	N	%	N	%	N	%			
Normal	46	93.9	3	6.1	49	100	10.353	1	0.001
Abnormal	35	68.6	16	31.4	51	100			
Total	81	81	19	19	100	100			

Table 5 shows the association between spirometry findings and depression. 12.2% (6) of those with normal spirometry had depression and 87.8% (43) had no depression. 17.6 % (9) of those with abnormal spirometry had depression and 82.4 % (42) had no depression. There is no statistically significant association between spirometry and depression.

Spirometry	Depression				Total		χ^2	df	p
	Normal		Abnormal						
	N	%	N	%	N	%			
Normal	43	87.8	6	12.2	49	100	0.572	1	0.449
Abnormal	42	82.4	9	17.6	51	100			
Total	85	85	15	15	100	100			

DISCUSSION:

This study investigates the psychological impact and spirometric patterns in patients (of age 18-70 years) six months post-recovery from COVID-19, with a focus on depression, anxiety, and their possible associations with respiratory function in one of the tertiary care centres of North India. We examined 100 individuals who had recovered from COVID-19 at least six months ago.

Socio-Demographic characteristics

Our study population had a wide age distribution, with a mean age of 41.3 years and a standard deviation of 14.2, indicating a diverse age group. Nearly 54% of participants were below 40 years of age, suggesting that younger individuals also experienced significant enough illness or symptoms to be part of this follow-up cohort. The median age in our study is 38 years. A similar age group was studied by Sehnaz Olgun Yildizeli et al [20], where the median age of the study group was 44 years. This finding aligns with recent evidence indicating that long COVID symptoms are not confined to the elderly and can affect younger individuals, especially those who were symptomatic during their acute phase.

A larger proportion of males (58%) were included in the study compared to females (42%). In the study by Mustafa Iteris et al [21], 49 (75.4%) candidates were males and 16 (24.6%) were females. This reflects findings from earlier waves of the pandemic where men were reported to have more severe disease outcomes.

Occupational distribution revealed that a significant number (27%) were housewives, and 31% were involved in business. The presence of 45% unemployed individuals (including 27% housewives) raises concern, as unemployment during the pandemic has been shown to be a strong predictor of mental health disorders such as anxiety and depression. The study conducted by Mustafa Iteris et al [21], also showed a similar distribution, with 60% of employed and 40% unemployed candidates.

Educational status also plays a crucial role in coping strategies and mental health outcomes. Nearly half (49%) of the participants had education levels below high school, which may limit access to health-related information, awareness about mental health, and utilization of support services. Lower educational attainment has been associated with higher psychological distress in several studies related to COVID-19 outcomes. According to the study of Chaolin Huang et al [22], anxiety /and depression were reported among 23% of patients at a period of 186 days. This result is similar to our study results.

The marital status data showed that 82% were married. While marriage is often considered a protective factor for mental health, the added stress of caring for family members, financial burdens, or the loss of income sources during the pandemic may imbalance this protective effect in some cases.

The religious distribution (67% Muslim, 33% Hindu) was representative of the local population. While the study did not explore religion as a variable in psychological impact, it is worth noting that coping mechanisms and community support systems often vary with cultural and religious background and may influence mental health outcomes.

Mental Health Outcomes

Our findings indicate that six months after recovering from COVID-19, a significant portion of patients continued to experience psychological symptoms. Although 85% had no depression, 14% had mild depression and 1% had moderate depression. These figures may not draw significant attention, but they still reflect an important public health issue. Even mild depression can impair daily functioning and quality of life, especially if left unrecognized or untreated. Additionally, a few studies such as that by Chaolin Huang et al [22], found that depressive symptoms can persist or even worsen over time in post-COVID populations.

Anxiety was slightly more prevalent than depression in our sample. 19% of patients reported varying degrees of anxiety—17% mild, 1% severe, and 1% extremely severe. These findings are consistent with global reports that anxiety is one of the most common long-term consequences of COVID-19. The lingering fear of reinfection, persistent physical symptoms like breathlessness, and worries about employment and finances likely contribute to this sustained anxiety. Furthermore, anxiety may be exacerbated by uncertainty surrounding long COVID and the limitations in post-acute care services.

Interestingly, no cases of stress were recorded based on the DASS-21 scale. This may suggest that while patients are experiencing mood and anxiety disorders, overt stress symptoms might be underreported, masked, or possibly resolved with time. Another possibility is that patients might have adapted or become desensitized to ongoing stressors over the course of the pandemic.

Respiratory Function And Spirometry Patterns

The spirometry patterns in our study revealed that only 49% of patients

had normal pulmonary function, while 51% showed some form of abnormality—28% obstructive, 20% restrictive, and 3% mixed patterns. These findings reinforce the growing body of evidence indicating long-term pulmonary sequelae in COVID-19 survivors. Restrictive patterns are commonly reported due to pulmonary fibrosis or parenchymal damage, while obstructive patterns could be related to airway hyperreactivity or undiagnosed pre-existing conditions exacerbated by COVID-19.

Association Between Mental Health And Spirometry

In our study, 35 participants displayed abnormal spirometry without concurrent anxiety symptoms. Notably, 16 subjects exhibited both abnormal spirometry and anxiety symptoms, a correlation that was found to be statistically significant (p-value = 0.001). This observation suggests that compromised lung function in certain individuals may provoke health-related apprehension, thereby amplifying anxiety levels. Patients who experience breathlessness or reduced lung function may develop anticipatory anxiety, fear of relapse, or even panic symptoms.

Furthermore, our findings revealed that 42 subjects presented with abnormal spirometry yet exhibited no signs of depressive symptoms, while 9 subjects demonstrated both depressive symptoms and abnormal spirometry. Importantly, no statistically significant association between spirometry and depression was observed. The findings in our study are in accordance with the study conducted by Kiran Kumar Gudivada et al [23], it was found that 35% (35/100) of mild to moderate COVID-19 patients exhibited abnormal PFTs (Pulmonary Function Tests). Notably, the prevalence of anxiety/depression was higher among patients with abnormal PFTs compared to those with normal lung function, with a prevalence ratio of 1.8 (20% vs. 11%).

Limitations

Despite its valuable insights, this study has limitations.

1. The study was conducted in a single center. Further exploratory research at the multicentric level is required to derive significant conclusions.
2. The sample size was small. Further studies with a larger sample size are required to derive significant recommendations which can lead to improved outcomes in patients recovered from COVID-19.
3. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out. Additionally, only patients attending the OPD were taken as study subjects and hence the study population lacked asymptomatic individuals

CONCLUSION

To summarize the current findings, a significant proportion of patients continue to experience psychological symptoms such as anxiety and depression six months post-COVID-19 recovery. Anxiety, in particular, shows a strong association with abnormal spirometry findings, underlining the psychosomatic relationship between respiratory health and mental well-being. The study emphasizes the urgent need for a holistic, patient-centered approach to post-COVID care, combining physical and psychological rehabilitation to support full recovery.

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