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ORIGINAL ARTICLE

Frequency of new-onset various autoimmune diseases in patients recovered from COVID-19 pneumonia

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) has been associated with long-term immune dysregulation and may predispose recovered patients to development of autoimmune diseases. This study aimed to determine the frequency of new-onset autoimmune diseases in patients recovered from COVID-19 pneumonia. The aim of this is to determine the frequency of new-onset various autoimmune diseases in patients recovered from COVID-19 pneumonia.

Material and Methods: This Descriptive cross-sectional study was conducted at the Department of General Medicine, Lahore General Hospital, Lahore, from 02 December 2025 to 02 April 2026. A total of 191 patients aged 18–70 years with documented recovery from COVID-19 pneumonia for at least six months were enrolled through non-probability consecutive sampling. Patients presenting with symptoms suggestive of autoimmune disease underwent targeted evaluation under specialist guidance.

Results: Mean age was 44.2 ± 13.6 years, while 108 (56.5%) were males. New-onset autoimmune diseases were identified in 49 (25.7%) patients. Autoimmune thyroiditis was the most frequent disorder in 14 (7.3%) patients, followed by alopecia areata in 11 (5.8%), rheumatoid arthritis in 10 (5.2%), psoriasis in 6 (3.1%), systemic lupus erythematosus in 3 (1.6%), and ANCA-associated vasculitis in 1 (0.5%) patient. Autoimmune diseases were significantly more common in females (p=0.048) and in patients with comorbidities (p=0.041).

Conclusion: It is concluded that a considerable proportion of patients with a history of COVID-19 pneumonia were later diagnosed with new-onset autoimmune diseases, likely related to persistent immune dysregulation.

Keywords: Autoimmune diseases, COVID-19 pneumonia, Immune dysregulation, Post-COVID complications.

BACKGROUND

Since its outbreak in late 2019, the COVID-19 pandemic, which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has had a substantial impact on the world. It has so far infected more than 768 million people all over the world, with about 6.9 million deaths.[1] More than 1.5 million people have been infected with the virus, and the mortality rate is approximately 2.14% in Pakistan.[2,3] COVID-19 exhibits a wide spectrum of clinical manifestations, ranging from asymptomatic infection to severe illness. Patients with severe acute COVID-19 may develop complications such as pneumonia, acute respiratory distress syndrome, sepsis, multiorgan failure, and death. The rapid spread and high mortality associated with COVID-19 have resulted in unprecedented health challenges and substantial socioeconomic consequences worldwide.[4,5] The first spikes of the COVID-19 pandemic have dimmed, but the long-term impacts are increasingly evident. Individuals who have recovered from COVID-19, especially those with severe infections, have reported diverse long-lasting symptoms and complications, which have been collectively termed long COVID or post-COVID-19 condition. Such effects are chronic fatigue, respiratory problems, cardiovascular problems, neurological problems, and psychological effects, such as anxiety and depression. Moreover, there is also new evidence that COVID-19 could be linked with the emergence of new-onset autoimmune diseases. This process has raised concerns about the future medical consequences of COVID-19 and the need to continue medical monitoring and research.[6,7] Autoimmune diseases are conditions in which the immune system attacks its own tissues, leading to chronic inflammation and tissue damage. Possible mechanisms behind this association include molecular mimicry, in which viral antigens mimic self-antigens, leading to an autoimmune response and immune dysregulation. As an example, SARS-CoV-2 was reported to cause the formation of

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autoantibodies, which could also be long-term and lead to the appearance of autoimmune diseases. This process can be accentuated by chronic inflammation and the release of autoantigens caused by the damage of tissues during the infection.[8,9]

A study evaluated 125 patients from US with COVID-19 infection, aged 16-85 years (mean ± SD, 41.68 ± 15.12 years), including 67 (53.6%) females and 58 (46.4%) males. The following autoimmune diseases were observed: psoriasis in 13.6% of cases, vitiligo in 8%, alopecia areata in 4.8%, and lupus erythematosus in 3.2%.[3] Another study indicated the following incidences of autoimmune diseases in COVID-19 patients: alopecia areata (11.79%), psoriasis (5.40%), vitiligo (2.59%), ANCA-associated vasculitis (0.26%), rheumatoid arthritis (16.92%), systemic lupus erythe In a detailed study, the overall prevalence of any autoimmune disease in COVID-19 patients was 0.829%, with certain conditions having prevalence rates of psoriasis (0.161%) and autoimmune thyroiditis (0.097 %).[11] The connection between COVID-19 and the emergence of new-onset autoimmune diseases is essential in designing effective long-term care plans for patients who have survived COVID-19. Although data related to autoimmune diseases post-COVID-19 have been reported from various countries, literature is scarce from Pakistan. The study seeks to explore the prevalence of new-onset autoimmune diseases among patients who have recovered and received treatment for COVID-19 pneumonia, thereby contributing to a thorough evaluation of the long-term health outcomes of COVID-19 in a group of patients in Pakistan. The objective of this study is to determine the frequency of various new-onset autoimmune diseases in patients who have recovered from COVID-19 pneumonia.

MATERIAL AND METHODS

This Descriptive cross-sectional study was conducted at the Department of General Medicine, Lahore General Hospital, Lahore, from 2 December 2025 to 2 April 2026. This study is approved by ethical committee of hospital with approval number 2025/ERC/44 dated 03 June 2025. Using WHO calculator, the sample size was calculated with an assumed prevalence of lupus erythematosus as 3.2%, a confidence level of 95%, and a margin of error of 2.5%. The required sample size was estimated to be 191 participants.[3] A non-probability consecutive sampling method was used to recruit eligible patients who met the inclusion criteria. The study was conducted in patients of both sexes aged 18-70 years with a documented history of COVID-19 pneumonia. The diagnosis was confirmed by positive RT-PCR of SARS-CoV-2 documented and radiographic evidence that included the presence of ground-glass opacities, consolidation, or bilateral infiltrates on the chest radiograph. Only patients who had fully recovered from COVID-19 pneumonia at least six months before enrollment and reported high levels of inflammatory markers (CRP, D-dimers, serum ferritin, LDH) during their infections were included. COVID-19 pneumonia was classified according to the relevant WHO clinical management guidelines and confirmed by positive RT-PCR along with radiographic evidence of pulmonary involvement (WHO, 2025). Patients with elevated inflammatory markers during acute infection were specifically included because persistent inflammation and immune activation have been proposed as potential mechanisms contributing to post-COVID autoimmune phenomena. This subgroup was therefore selected to evaluate the frequency of autoimmune diseases among individuals considered at higher risk for immune-mediated complications following COVID-19. All data collected were anonymized by removing direct identifiers and assigned secure alphanumeric codes. All records are stored on password-protected, encrypted servers accessible only to the primary research team, in accordance with the university's data protection policy. Eligibility was ensured by reviewing medical records in detail, including RT-PCR results and radiographic findings consistent with COVID-19 pneumonia. Simple demographic and clinical data, such as age and gender, comorbidities, and the COVID-19 vaccination status were collected. An individualised autoimmune workup was conducted under the supervision of a rheumatologist, based on each patient's clinical presentation. Autoimmune diseases, including systemic lupus erythematosus, ANCA-associated vasculitis, psoriasis, vitiligo, alopecia areata, rheumatoid arthritis, Sjögren syndrome, and autoimmune thyroiditis, were recorded according to operational criteria. A structured proforma was used to collect all data.

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Categorical variables, including gender, comorbidities, vaccination status, and autoimmune disease status,

were presented as frequencies and percentages, while continuous variables, such as age, were reported as mean ± standard deviation. Normality of continuous data was assessed using the Shapiro-Wilk test. Parametric data were analyzed using independent sample t-test, Stratification was performed to control for potential confounders, including age, gender, comorbidities, and vaccination status. Associations were analyzed using chi-square test, while comparisons of laboratory parameters were performed using independent sample t-test. A p-value of ≤0.05 was considered statistically significant.

RESULTS

The study included 191 patients recovered from COVID-19 pneumonia. The mean age was 44.2 ± 13.6 years, and males were slightly more common than females, with 108 (56.5%) males and 83 (43.5%) females. Regarding comorbidities, 74 (38.7%) patients had no comorbidity, while hypertension was present in 52 (27.2%), diabetes mellitus in 41 (21.5%), and combined diabetes mellitus with hypertension in 24 (12.6%) patients (Table-I).

Table-II shows clinical and laboratory parameters. Fatigue was the most reported symptom, present in 117 (61.3%) patients, followed by joint pain in 100 (52.4%).

Table-III shows the list of new onset autoimmune diseases diagnosed. Out of 191 patients, 49 (25.7%) developed at least one new-onset autoimmune disease following recovery from pneumonia.

Table-IV shows association of autoimmune diseases with different demographic variables. Autoimmune diseases were significantly more common in females compared to males, (p = 0.048). Similarly, patients with comorbidities had a significantly higher frequency of autoimmune diseases compared to those without comorbidities (p = 0.041).

Table-V shows association of laboratory findings with autoimmune diseases. Median CRP levels were higher in the autoimmune disease group (p = 0.003). Similarly, median ferritin levels were significantly elevated among patients with autoimmune diseases (p = 0.010).

Table-I: Baseline demographic and clinical characteristics (n = 191).

Variable	Category	n (%) / Mean ± SD
Age (years)	—	44.2 ± 13.6
Gender	Male	108 (56.5%)
	Female	83 (43.5%)
Comorbidities	None	74 (38.7%)
	Hypertension	52 (27.2%)
	Diabetes Mellitus	41 (21.5%)
	DM + HTN	24 (12.6%)
Vaccination Status	Vaccinated	129 (67.5%)
	Unvaccinated	62 (32.5%)
Recovery Duration (months)	—	10.8 ± 3.4

Table-II: Clinical and laboratory characteristics of patients (n = 191).

Variable	Category	n (%) / Mean ± SD
Clinical Presentation	Fatigue	117 (61.3%)
	Joint Pain	100 (52.4%)
	Respiratory Symptoms	76 (39.8%)
	Skin Rash	65 (34.0%)
	Muscle Weakness	61 (31.9%)
	Dry Eyes/Mouth	53 (27.7%)
	Renal Symptoms	38 (19.9%)
	Hemoptysis	18 (9.4%)
Laboratory Parameters	CRP (mg/L)	54.7 ± 21.3
	D-dimer (µg/mL)	1.72 ± 0.68
	Ferritin (ng/mL)	468.5 ± 152.6
	LDH (U/L)	452.1 ± 88.7

Table-III: Frequency of new-onset autoimmune diseases (n = 191).

Autoimmune Disease	n (%)
Autoimmune Thyroiditis	14 (7.3%)
Alopecia Areata	11 (5.8%)
Rheumatoid Arthritis	10 (5.2%)
Psoriasis	6 (3.1%)
Vitiligo	4 (2.1%)
Systemic Lupus Erythematosus	3 (1.6%)
ANCA-associated Vasculitis	1 (0.5%)
At least one autoimmune disease	**49 (25.7%)**

Table-IV: Association of autoimmune diseases with demographic variables.

Variable	Category	Autoimmune Disease Present n (%) (n=49)	Absent n (%) (n=142)	p-value
Gender	Male	23 (21.3%)	85 (78.7%)	0.048
	Female	26 (31.3%)	57 (68.7%)	
Comorbidities	Present	35 (29.9%)	82 (70.1%)	0.041
	None	14 (19.0%)	60 (81.0%)	
Vaccination	Vaccinated	31 (24.0%)	98 (76.0%)	0.27

DISCUSSION

The current research determined the frequency and distribution of new-onset autoimmune diseases among COVID-19 pneumonia survivors. The results shows that one fourth of patients were diagnosed at least one autoimmune disorder after recovery, indicating a high risk of immune dysregulation after the COVID-19 pandemic. The findings of Sandhu *et al*. also highlighted that COVID-19 may influence autoimmune disease activity through systemic inflammation, immune activation, and post-infectious dysregulation. In comparison, the present study extends this concern to recovered COVID-19 pneumonia patients who developed new autoimmune diagnoses. However, unlike longitudinal studies, this study cannot determine whether these autoimmune conditions were directly caused by COVID-19, unmasked by infection, or developed independently after recovery. Therefore, future prospective studies with defined follow-up intervals, baseline autoimmune screening, and control groups are required to clarify the temporal and causal relationship between COVID-19 pneumonia and autoimmune disease development.[14]

The presence of autoimmune diseases was also strongly related to comorbid conditions in the study population. The frequency of autoimmune manifestations was higher among patients with diabetic mellitus and hypertension than among patients without comorbidities. It can be explained by the presence of chronic low-grade inflammation and immune dysregulation typical of such patients, which may be aggravated by SARS-CoV-2 infection.[15,16] The interplay between metabolic diseases and immune dysfunction likely creates a permissive environment in which autoimmune phenomena can occur. The clinical presentation of patients in this study was dominated by nonspecific but suggestive symptoms, including fatigue, joint pain, and respiratory complaints. The most prevalent symptom mentioned was fatigue, which was experienced by over fifty percent of the patients, then joint pain and respiratory symptoms.[17] These results align with the clinical spectrum of post-COVID syndrome, in which fatigue and musculoskeletal complaints are commonly reported. Notably, the symptoms are like the initial symptoms of autoimmune diseases, and clinical suspicion and proper workup is vital to make a prompt diagnosis. The existence of chronic inflammation in the population under study was also supported by laboratory results. There was a high level of CRP, ferritin, D-dimer, and LDH, indicating the presence of inflammatory and prothrombotic processes in the body even during recovery from acute infection. Interestingly, patients who developed autoimmune conditions showed a significant increase in CRP and ferritin levels compared to their counterparts without autoimmune disease.[18] This suggests that the extent of the inflammatory response during or after COVID-19 infection could be an important factor in the development of autoimmune mechanisms. The continued activation of the immune system can lead to loss of self-tolerance and the development of autoantibodies. The most prevalent autoimmune disease was autoimmune thyroiditis, followed by alopecia areata, rheumatoid arthritis, and psoriasis. This distribution is in line with other past studies that organ-specific autoimmune diseases, especially thyroid

disorders, are some of the most common post-infectious autoimmune diseases.[19] The relatively greater prevalence of autoimmune thyroiditis may be attributed to elevated angiotensin-converting enzyme 2 (ACE2) receptor levels in thyroid tissue, which enable the virus to enter the tissue and cause direct or immune-mediated tissue damage. Endothelial dysfunction is another mechanism that has been extensively found in COVID-19 patients. Endothelial damage may expose self-antigens and activate the immune system, further contributing to autoimmune mechanisms. Moreover, T-cell responses, especially decreased regulatory T-cell activity, can be dysregulated, weakening immune tolerance and promoting autoimmunity.[20] These study results are in line with the previous studies that have reported an upsurge in the incidence of autoimmune diseases after getting infected with COVID-19. Past research has shown an increase in rheumatoid arthritis, systemic lupus erythematosus and thyroid conditions among those who have survived COVID-19 as opposed to those who have never been infected. As in the current study, these studies have also highlighted the importance of chronic inflammation and immune dysregulation in the pathogenesis of post-COVID autoimmunity.[21]

LIMITATIONS

Several limitations to this study must be taken into consideration when interpreting the results. To begin with, the cross-sectional design restricts the possibility of developing a causal relationship between COVID-19 pneumonia and the emergence of new-onset autoimmune diseases; it merely describes its frequency and factors associated with these. Second, the research was conducted at a single tertiary care center, which may limit the generalizability of the findings to the general population. Third, a control group (non-COVID population) is not provided, thus preventing a direct comparison of the autoimmune disease frequency, and it is challenging to measure the actual excess risk caused by COVID-19. Also, selection bias may exist because only patients with symptoms indicative of autoimmune disease were included, which could inflate the frequency.

CONCLUSION

New-onset autoimmune diseases were observed in 25.7% of patients who had recovered from COVID-19 pneumonia. Autoimmune thyroiditis, alopecia areata, and rheumatoid arthritis were the most frequently identified conditions. Autoimmune diseases were significantly more common among females and patients with comorbidities, while higher CRP and ferritin levels were also associated with autoimmune disease status. However, due to the cross-sectional design, absence of a control group, and limited temporal assessment, this study cannot establish a causal relationship between COVID-19 pneumonia and autoimmune disease development. Further prospective studies are required to clarify this association.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Namrah Fatima: Conceptualized, conducted the study, did analysis and wrote manuscript, final approval, accountable for every aspect of research.

Khurram Saleem: Main conceptual ideas and proof outline, critical reviews, final approval, accountable for every aspect of research.

Samrah Fatima: Carried out statistical analysis, final approval, accountable for every aspect of research.

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