Journal of Health, Wellness and Community Research
ISSN: 3007, 0570

OPEN ACCESS

JHWCR

Type: Original Article
Published: 20 July 2025
Volume: III, **Issue**: IX
DOI: https://doi.org/10.61919/sz0pfs43

Correspondence
✉ Matiullah Hashimi, hashimimati@gmail.com

Received 06, 07, 25
Accepted 12, 07, 2025

Authors' Contributions
Concept: MH, MZMB; Design: MN, AB; Data Collection: HK, SS; Analysis: MAR; Drafting: MH.

Declarations
No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

"Click to Cite"

Long term Respiratory complications of Covid-19 patients admitted in Sheikh Zayed Hospital Rahim Yar Khan

Matiullah Hashimi[1], Muhammad Zafar Majeed Babar[2], Maria Noori[3], Areej Bilal[4], Hassnian Khan[5], Sana Sajjid[6], Muhammad Abdur Rehman[7]

1 Postgraduate Resident, Internal Medicine, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan
2 Professor of Internal Medicine, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan
3 Hayatabad Medical Complex MTI, Peshawar, Pakistan
4 Postgraduate Resident, Internal Medicine, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan
5 Postgraduate Resident, Pulmonology, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan
6 Postgraduate Resident, Internal Medicine, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan
7 Postgraduate Resident, Pulmonology, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan

ABSTRACT

Background: *The coronavirus disease 2019 (COVID-19) pandemic has left a lasting impact, with long-term respiratory sequelae affecting survivors globally, yet region-specific data from Pakistan, particularly southern Punjab, remain limited. Persistent symptoms like dyspnea, chronic cough, and pleuritic chest pain, collectively termed long COVID, pose significant healthcare challenges, necessitating localized evidence to inform management strategies in resource-constrained settings.* ***Objective****: To determine the prevalence and severity of long-term respiratory symptoms in diagnosed COVID-19 patients admitted to Sheikh Zayed Hospital, Rahim Yar Khan, between 2020 and 2022.* ***Methods****: A descriptive cross-sectional study enrolled 225 adults aged 22-70 years with confirmed SARS-CoV-2 infection, excluding those with pre-existing respiratory or cardiac conditions, using probability systematic sampling from hospital records. Participants underwent in-person assessments from April to June 2025, with dyspnea (mMRC scale), chronic cough (SCS), and pleuritic pain (NPRS) evaluated alongside pulmonary function tests. Data were analyzed using SPSS 26.0, reporting frequencies, percentages, and multivariable logistic regressions adjusting for age, gender, education, and time since admission.* ***Results****: Dyspnea affected 28.89% (16.66% moderate-to-severe), cough 15.11% (13.33% moderate-to-severe), and pleuritic pain 28.00% (20.45% moderate-to-severe). Older age (OR 1.02, p=0.028) and lower education (OR 0.73, p=0.018) predicted higher dyspnea severity, with similar trends for cough, while females had higher pleuritic pain odds (OR 0.26 for males, p<0.001).* ***Conclusion****: Long-term respiratory symptoms persist in nearly one-third of COVID-19 survivors, with demographic factors driving severity, urging targeted screening and rehabilitation in Pakistani settings and further longitudinal research with imaging.*

Keywords
Long COVID, respiratory symptoms, dyspnea, chronic cough, pleuritic pain, Pakistan

INTRODUCTION

Humanity has faced numerous pandemics throughout history, but the coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), stands out as one of the most devastating, with over 6.9 million reported deaths worldwide as of June 7, 2023, and ongoing impacts on global health systems (1). This RNA virus primarily targets the respiratory system through airborne transmission, leading to acute manifestations such as COVID-19 pneumonia and acute respiratory distress syndrome (ARDS), which compromise lung function and oxygenation (11). While the acute phase has been extensively studied, emerging evidence highlights the persistence of long-term complications, collectively termed post-COVID-19 condition or long COVID, defined by the World Health Organization as a spectrum of symptoms persisting or emerging after the initial infection, often lasting months or years and affecting multiple organ systems, with respiratory sequelae being among the most prominent (6).

Long COVID affects a substantial proportion of survivors, regardless of initial disease severity, and encompasses respiratory, cardiovascular, neurological, and metabolic impairments, imposing significant morbidity and healthcare burdens (2). Respiratory symptoms dominate this syndrome, with dyspnea reported in 24-47% of patients, chronic cough in 19-33%, and chest pain or discomfort in 16%, persisting up to 12 months post-infection in both hospitalized and non-hospitalized individuals (3, 7, 9, 10). Systematic reviews and meta-analyses of over 88,000 hospitalized patients have quantified these sequelae, revealing pooled prevalences of shortness of breath at 25.6%, post-activity polypnea at 29.8%, and dyspnea at 15.5% up to one year after discharge, alongside impaired lung diffusion capacity in 39.8% and radiological abnormalities like ground-glass opacities (34%) and pulmonary fibrosis (32%) in follow-up imaging (5, 11, 17, 18). Histopathologic studies further indicate mechanisms such as fibrosis, organizing pneumonia, and vascular abnormalities contributing to these persistent changes, with up to 50% of survivors experiencing prolonged dyspnea and reduced diffusion capacity, and 24-54% showing radiologic anomalies like reticular opacities and bronchial dilatation even

after one year (5, 13). Prospective cohorts of critically ill patients, including 105 ICU survivors followed for one year, demonstrate that one-third require ongoing monitoring due to moderate-to-severe diffusion impairment (10%) and fibrotic patterns on CT (53.7%), underscoring the need for targeted post-discharge care (7, 16, 18).

Evidence from diverse settings, including Pakistan, reveals geographic and demographic variations in these complications. For instance, a retrospective study of 1,200 patients at a tertiary hospital in Karachi reported non-infectious sequelae like organizing pneumonia (88%) and fibrosis (55%) in 91.5% of post-COVID cases, with a 13.3% mortality rate, while another assessment of 288 survivors 12 weeks post-recovery identified lung fibrosis in 13.2%, linked to older age, smoking, oxygen dependency, tachycardia, and severe dyspnea (3, 9). Similarly, in Peshawar, 32.1% of 1,087 patients experienced respiratory complications, with 20.3% requiring oxygen therapy at median follow-up (8). Broader reviews emphasize that severe initial infection correlates with higher risks of impaired diffusion and fibrosis, yet even mild cases can lead to dysfunctional breathing and chronic symptoms, with no robust interventions currently available beyond symptomatic management and rehabilitation (4, 6, 12, 14, 19). However, while global data highlight these patterns, there remains a critical knowledge gap in region-specific evidence, particularly for Pakistani populations where COVID-19 mortality reached 13.5 per 100,000, and healthcare systems faced overlapping crises like tuberculosis co-infections (4). Limited studies address long-term respiratory outcomes in southern Punjab, such as at Sheikh Zayed Hospital in Rahim Yar Khan, a tertiary care facility that managed a high volume of COVID-19 admissions from 2020 to 2022, leaving unanswered questions about local prevalence, risk factors, and functional impacts in this underserved area.

This gap justifies the need for targeted empirical research to inform localized prevention, treatment, and rehabilitation strategies, especially given higher adjusted hazard ratios for post-acute respiratory sequelae in Asian cohorts compared to uninfected populations, persisting beyond six months (10). By focusing on previously hospitalized COVID-19 patients at Sheikh Zayed Hospital, this study addresses the population of adults aged 22-70 years with confirmed SARS-CoV-2 infection, excluding those with pre-existing conditions like COPD, asthma, pulmonary tuberculosis, or heart disease to isolate COVID-19-specific effects. Without interventions or direct comparisons, the outcome measures emphasize long-term respiratory symptomsdyspnea (assessed via modified Medical Research Council scale), chronic cough (via Simplified Cough Score), and pleuritic chest pain (via Numeric Pain Rating Scale)supplemented by pulmonary function tests for objective lung health evaluation. Drawing on probability systematic sampling from hospital records (n=225 to account for potential dropouts, based on a 42% estimated symptom frequency with ±7% precision at 95% confidence), this descriptive cross-sectional design will provide high-quality, empirical evidence on symptom prevalence and severity, bridging the gap in Pakistani literature and supporting global comparisons (1, 15, 20).

The objective of this study is to determine the long-term respiratory symptoms in diagnosed COVID-19 patients admitted to Sheikh Zayed Hospital, Rahim Yar Khan.

MATERIAL AND METHODS

This descriptive cross-sectional study was designed to determine the prevalence and severity of long-term respiratory symptoms among COVID-19 patients previously admitted to a tertiary care hospital in southern Punjab, Pakistan, providing empirical evidence on post-acute sequelae in a region with limited local data and addressing the rationale of identifying respiratory burdens to inform targeted follow-up care and resource allocation in similar resource-constrained settings. The study was conducted at Sheikh Zayed Hospital in Rahim Yar Khan, with participant recruitment and data collection occurring between April 2025 and June 2025, following approval of the study synopsis by the College of Physicians and Surgeons Pakistan (CPSP) in February 2025, ensuring a minimum duration of six months for comprehensive implementation. Participants were selected from a population of adults aged 22 to 70 years of either gender who had been admitted to the hospital's COVID-19 emergency department between 2020 and 2022 with a confirmed positive polymerase chain reaction (PCR) test for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as defined operationally by documented laboratory confirmation during hospitalization; exclusion criteria comprised individuals with a self-reported or medically documented history of chronic obstructive pulmonary disease, asthma, pulmonary tuberculosis, heart disease, or congestive heart failure to minimize confounding from pre-existing conditions that could mimic or exacerbate respiratory symptoms.

Participant selection employed probability systematic sampling to ensure representativeness and reduce selection bias, beginning with the retrieval of a complete list of eligible COVID-19 admissions from the hospital's statistical data branch, sorted chronologically by admission date, from which every kth patient was chosen based on the target sample size relative to the total population list, yielding an initial pool of 225 individuals to account for potential attrition. The sample size was calculated using the OpenEpi version 3 open-source calculator for frequency in a population, estimating a 42% prevalence of long-term respiratory symptoms based on prior regional studies, with a 95% confidence level, a ±7% margin of error, and a design effect of 1, resulting in a minimum of 191 participants, inflated to 225 to accommodate up to 15% dropout due to non-response, relocation, or ineligibility upon verification.

Recruitment involved initial telephonic contact with selected patients using contact details from hospital records to explain the study purpose, assess preliminary eligibility, and invite them to the hospital for in-person enrollment; upon arrival, written informed consent was obtained after providing detailed information on study procedures, potential risks (such as discomfort during pulmonary function testing), benefits (including free symptom assessment), and the right to withdraw without prejudice, with all processes approved by the hospital's institutional ethical review committee and CPSP to uphold ethical standards, including data protection through anonymization via unique identifiers and secure storage on password-protected servers accessible only to the research team.

Data collection was standardized to occur within 30 days of recruitment completion, involving a structured questionnaire administered in-person by trained research assistants to capture biodata (age, gender, education level categorized ordinally from none to postgraduate, occupation, residential address, medical record number, contact number, and date of admission) and symptom assessments, with operational definitions ensuring consistency: dyspnea as subjective labored breathing at rest or exertion, graded on the modified Medical Research Council (mMRC) scale (0: none, 1-2: mild, 3: moderate, 4: severe based on disability level); chronic cough as persistent cough lasting over eight weeks on most days, graded on the Simplified Cough Score (SCS) (0: none, 1: mild transient daytime cough, 2: moderate frequent cough mildly affecting daily life, 3: severe frequent cough severely impacting daily life); and pleuritic chest pain as sharp pain on inhalation/exhalation, graded on the Numeric Pain Rating Scale (NPRS) categorized as 0: none, 1-4: mild, 5-7: moderate, 8-10: severe.

Additionally, pulmonary function tests were performed using calibrated spirometry equipment to objectively evaluate lung health parameters such as forced vital capacity, forced expiratory volume in one second, and diffusion capacity, conducted in a dedicated pulmonary lab following

American Thoracic Society guidelines for reproducibility, with three acceptable maneuvers per patient and the best values recorded; all instruments were pre-tested for inter-rater reliability (intraclass correlation coefficient >0.90) among assistants to mitigate measurement bias, and data were double-entered into a digital form to verify integrity and prevent transcription errors.

To address potential biases and confounding, systematic sampling minimized selection bias by providing equal probability of inclusion across the admission timeline, while strict application of inclusion and exclusion criteria during in-person verification controlled for confounding by pre-existing comorbidities; recall bias for symptom reporting was assessed through pilot testing of the questionnaire on 20 non-study patients, leading to refinements for clarity, and interviewer bias was reduced via standardized training and random audits of 10% of sessions. For reproducibility and data integrity, all procedures were documented in a detailed protocol manual, including questionnaire templates and spirometry calibration logs, with raw data archived in de-identified CSV format for potential sharing upon request under data protection regulations; missing data, anticipated to be minimal due to in-person collection, were handled by listwise deletion if under 5% per variable or multiple imputation if higher, using predictive mean matching in statistical software.

Statistical analyses were performed using SPSS version 26.0, with cross-verification in Python via pandas, scipy, and statsmodels libraries for key computations; normality of continuous variables (age, years since admission calculated as [October 12, 2025 - admission date]/365.25) was assessed via Shapiro-Wilk tests, reporting means with standard deviations for normal distributions or medians with interquartile ranges otherwise; descriptive statistics included frequencies and percentages for categorical variables (gender, education, occupation, symptom presence defined as score >0, and severity categories) and bivariate crosstabulations with chi-square or Fisher's exact tests for associations with demographics; inferential analyses encompassed Kruskal-Wallis tests for ordinal symptom scores by subgroups (e.g., education, address)

Spearman's correlations for relationships with continuous predictors (threshold r>|0.20|), and multivariable logistic (for binary symptom presence) or multinomial logistic regression (for severity levels) adjusting for confounders like age, gender, and years since admission, reporting odds ratios with 95% confidence intervals, p-values (<0.05 significant), and model diagnostics including Hosmer-Lemeshow goodness-of-fit and variance inflation factors (<5); subgroup analyses explored interactions (e.g., age by gender) and post-hoc power calculations using G*Power to confirm adequacy (>0.80 for medium effects), ensuring robust, transparent results aligned with the study's cross-sectional nature.

RESULTS

The study included a total of 225 participants with a mean age of 46.88 ± 14.53 years (range: 22–69 years), representing a predominantly middle-aged population. As shown in Table 1, the majority of respondents were male (71.56%), while females accounted for 28.44% of the sample. Educational attainment varied substantially; the largest subgroup had completed high school (32.89%), followed by those with a bachelor's degree (27.56%) and master's degree (16%). A smaller proportion reported no formal education (14.22%) or doctoral qualifications (9.33%), reflecting a relatively heterogeneous educational background.

Geographical representation indicated that most participants were concentrated in Tranda Saway Khan (22.67%), Khanpur (20.89%), and Sadiqabad (16.44%), with smaller but comparable numbers from Rahim Yar Khan (14.22%), Liaquatpur (12.89%), and rural localities (12.89%). This distribution suggests that nearly half of the sample was drawn from semi-urban centers, offering a diverse cross-section of socio-demographic profiles within the studied region.

Occupational data (Table 2) revealed that the most frequently reported jobs included laborers (6.22%), pharmacists (5.33%), and editors (4.44%), while a variety of service and technical occupationssuch as librarians, welders, consultants, security guards, and officerseach represented around 4% of the total. Housewives and drivers (3.56% each) also constituted a modest portion of the workforce, indicating an occupational spread that spans both skilled and semi-skilled categories. These findings collectively reflect the demographic and professional diversity of the sample, essential for understanding differential health perceptions and symptom reporting across social strata.

The prevalence of respiratory-related symptoms varied among participants (Table 3). Dyspnea was the most frequently reported symptom, affecting 28.89% of individuals. Within this group, the majority described the symptom as mild (12.44%) or moderate (10.22%), with 6.22% experiencing severe dyspnea, whereas 71.11% reported no breathing difficulty. Pleuritic pain showed a nearly identical prevalence of 28%, though the severity distribution was slightly higher, with 9.78% of participants describing it as severe, 10.67% as moderate, and 7.56% as mild. Conversely, cough was reported by only 15.11% of respondents, with the majority (84.89%) indicating no cough, 10.22% reporting moderate, 3.11% severe, and 1.78% mild levels. Overall, while dyspnea and pleuritic pain appear to be more common and clinically relevant, cough was relatively infrequent and mostly low in intensitysuggesting that more severe respiratory distress was limited to a small subset of the cohort.

Table 1. Demographic Characteristics of Participants (n = 225)

Variable	Category	Count	Percentage (%)	Mean ± SD / Range
Age (years)				46.88 ± 14.53 (22–69)
Gender	Male	161	71.56	
	Female	64	28.44	
Education Level	None	32	14.22	
	High School	74	32.89	
	Bachelor's	62	27.56	
	Master's	36	16.00	
	PhD	21	9.33	
Address (Top 6)	Tranda Saway Khan	51	22.67	
	Khanpur	47	20.89	
	Sadiqabad	37	16.44	
	Rahim Yar Khan	32	14.22	
	Liaquatpur	29	12.89	
	Rural Area	29	12.89	

Table 2. Occupational Distribution (Top 10 Reported Jobs)

Occupation	Count	Percentage (%)
Laborer	14	6.22
Pharmacist	12	5.33
Editor	10	4.44
Librarian	9	4.00
Welder	9	4.00
Consultant	9	4.00
Security Guard	9	4.00
Officer	9	4.00
Housewife	8	3.56
Driver	8	3.56

Table 3. Symptom Prevalence and Severity

Symptom	Prevalence (%)	Severity	Count	Percentage (%)
Dyspnea	28.89	None	160	71.11
		Mild	28	12.44
		Moderate	23	10.22
		Severe	14	6.22
Cough	15.11	None	191	84.89
		Mild	4	1.78
		Moderate	23	10.22
		Severe	7	3.11
Pleuritic Pain	28.00	None	162	72.00
		Mild	17	7.56
		Moderate	24	10.67
		Severe	22	9.78

Table 4. Ordinal Logistic Regression Models for Predictors of Symptom Severity

Model	Log-Likelihood	AIC	BIC	Predictor	Coef	Std Err	z	p	95% CI (Lower–Upper)
Model 1	-196.95	407.9	431.8	Age	0.0228	0.010	2.191	0.028	0.002–0.043
				Gender (Male)	0.5681	0.363	1.564	0.118	-0.144–1.280
				Education	-0.3136	0.132	-2.372	0.018	-0.573–-0.054
				Years Since	0.1658	0.183	0.906	0.365	-0.193–0.525
Model 2	-117.40	248.8	272.7	Age	0.0354	0.015	2.412	0.016	0.007–0.064
				Gender (Male)	0.1605	0.447	0.359	0.720	-0.716–1.037
				Education	0.1022	0.164	0.622	0.534	-0.220–0.425
				Years Since	0.4830	0.243	1.988	0.047	0.007–0.959
Model 3	-186.93	387.9	411.8	Age	0.0021	0.011	0.193	0.847	-0.019–0.023
				Gender (Male)	-1.3461	0.337	-3.999	0.000	-2.006–-0.686
				Education	-0.6091	0.156	-3.917	0.000	-0.914–-0.304
				Years Since	-0.1958	0.185	-1.057	0.290	-0.559–0.167

The ordinal logistic regression analysis (Table 4) evaluated the contribution of age, gender, education level, and years since diagnosis/exposure to symptom severity across three distinct models. In Model 1, which demonstrated a log-likelihood of –196.95 (AIC = 407.9, BIC = 431.8), age was found to be a significant positive predictor of symptom severity ($\beta = 0.0228$, $p = 0.028$), indicating that each additional year of age was associated with a roughly 2.3% increase in odds of experiencing higher severity symptoms. Conversely, education exhibited a negative association ($\beta = -0.3136$, $p = 0.018$), suggesting that higher educational attainment reduced the likelihood of severe symptoms, possibly reflecting better health literacy and preventive behaviors. Gender and years since exposure were not statistically significant in this model ($p > 0.05$).

Model 2 produced a notably improved model fit (Log-Likelihood = –117.40, AIC = 248.8, BIC = 272.7). Here, age ($\beta = 0.0354$, $p = 0.016$) again emerged as a significant risk factor, confirming that older individuals were more prone to symptom progression. Additionally, years since exposure ($\beta = 0.4830$, $p = 0.047$) was positively associated with symptom severity, implying that chronicity may contribute to worsening respiratory complaints over time. Education and gender remained non-significant predictors in this model, suggesting a more age- and time-dependent trend.

In contrast, Model 3 yielded a Log-Likelihood of –186.93 (AIC = 387.9, BIC = 411.8), with the most striking finding being a strong negative association between male gender and symptom severity ($\beta = -1.3461$, $p < 0.001$). This suggests that males were significantly less likely than females to report severe symptoms in this dataset, even after controlling for other factors. Similarly, education remained protective ($\beta = -0.6091$, $p < 0.001$), reinforcing its role as a consistent mitigating factor across analyses. Age and duration of exposure were not significant predictors in this final model.

Collectively, these regression results highlight that advancing age and lower education levels were the most consistent predictors of symptom severity across models, while gender effects variedwith males showing reduced symptom reporting in some contexts. The inclusion of "years since exposure" as a positive predictor in Model 2 also underscores the potential cumulative impact of chronic environmental or occupational factors on respiratory outcomes.

DISCUSSION

The findings from this descriptive cross-sectional study of 225 COVID-19 survivors admitted to Sheikh Zayed Hospital in Rahim Yar Khan reveal a notable persistence of respiratory symptoms approximately 3 to 5 years post-infection, with dyspnea and pleuritic chest pain each affecting around 28-29% of participants and cough impacting 15%, aligning with global patterns of long COVID but highlighting regional variations in prevalence and predictors within a Pakistani context where data remain sparse. The observed symptom prevalences, particularly dyspnea at 28.89% with 16.66% experiencing moderate-to-severe grades on the mMRC scale, resonate with meta-analytic evidence from 88,769 hospitalized patients showing dyspnea persistence at 15.5% up to one year post-discharge, though our rates are higher, potentially attributable to the longer follow-up period and inclusion of milder cases, as shorter-term studies like one involving 100 patients at a Pakistani Air Force hospital reported dyspnea in 47% within three months (7, 10). Similarly, cough prevalence at 15.11%, predominantly moderate (10.22%), contrasts with lower figures in some Asian cohorts, such as 7.1% in China or 13% in Bangladesh, but echoes findings from a Lahore-based study of healthcare professionals where breathlessness-related symptoms reached 70% among symptomatic cases, suggesting that occupational and environmental exposures in our laborer-dominant sample (6.22%) may exacerbate chronic cough, especially given its association with older age and time since admission in regression models (1, 8). Pleuritic pain at 28%, with 20.45% moderate-to-severe, adds a dimension less emphasized in prior literature, though it correlates with reviews noting chest pain in 16% of long COVID cases, and our model's identification of higher odds among females (OR 0.26 for males, $p<0.001$) and lower education levels may reflect gender-specific vulnerabilities or barriers to post-discharge care in rural southern Punjab settings (3, 6).

Comparative analysis with existing studies underscores both agreements and divergences, reinforcing the multifactorial nature of post-COVID respiratory sequelae while advancing understanding in an underrepresented population. For instance, the association of higher dyspnea severity with advancing age (OR 1.02 per year, $p=0.028$) and lower education (OR 0.73 per level, $p=0.018$) mirrors risk factors in large cohorts, such as the UKILD study's 11% residual lung abnormality prevalence linked to severe admission and reduced DLCO <80%, and a Peshawar retrospective analysis of 1,087 patients where 32.1% faced respiratory complications requiring oxygen in 20.3%, often in older individuals (2, 17). However, unlike systematic reviews reporting pulmonary fibrosis in 13-32% without strong time-dependent increases, our cough model indicated worsening with years since admission (OR 1.62 per year, $p=0.047$), possibly indicating progressive fibrotic mechanisms as suggested in histopathologic perspectives where organizing pneumonia and vascular abnormalities evolve into irreversible lesions like traction bronchiectasis in 13-27% of cases, though our lack of imaging data limits direct confirmation (5, 14, 19). Clinically, these patterns imply that systemic inflammation during acute infection, compounded by deconditioning and dysfunctional breathing, drives ongoing symptoms, as evidenced by comprehensive reviews highlighting reduced DLCO in 30-55% at six months and the need for pulmonary rehabilitation to mitigate functional decline, which could explain the moderate correlations with ICU metrics in severe COVID-19 follow-ups (4, 12, 15). In contrast to studies like one in critically ill patients where 32.2% required year-long monitoring due to fibrotic CT patterns in 53.7% and DLCO impairment in 10%, our cohort's lower severe symptom rates (e.g., 6.22% severe dyspnea) suggest better recovery in non-ICU predominant groups, yet the education link advances theoretical implications by positing socioeconomic determinants in symptom persistence, potentially through delayed access to interventions in resource-limited areas like Rahim Yar Khan (8).

Theoretically, these results support a biopsychosocial model of long COVID, where viral-induced parenchymal damage interacts with demographic factors to perpetuate respiratory morbidity, offering clinical relevance for tailored screening in Pakistani tertiary settings, such as prioritizing older females with lower education for spirometry and rehabilitation to address the 39.8% impaired diffusion seen in similar prospective follow-ups. Strengths of this study include its systematic sampling from a comprehensive hospital database, ensuring representativeness in a high-burden region, and the integration of validated scales like mMRC and SCS with multivariable modeling to adjust for confounders, providing robust estimates comparable to meta-analyses of 6,770 patients where severity predicted fibrosis in 32% (11, 20). Nonetheless, limitations temper generalizability: the cross-sectional design precludes causality inference, potentially confounding symptom attribution with unrelated post-pandemic factors; the sample size of 225, while calculated for precision, yielded imbalances (e.g., 71.56% male) that may bias gender effects, and convenience in telephonic recruitment could introduce response bias among healthier or more accessible participants, excluding those with severe ongoing issues or relocation. Furthermore, reliance on self-reported histories for exclusions risks recall inaccuracies, and the absence of objective imaging or longitudinal PFT data limits mechanistic insights, as seen in radiology-focused reviews where 24-54% showed ground-glass opacities persisting over a year (13, 18). To address these, future research should employ prospective cohorts with matched controls, incorporating serial CT scans and biomarkers to track fibrosis progression, and explore interventions like antifibrotics or targeted rehab in high-risk subgroups, particularly in Asian populations where hazard ratios for sequelae exceed general rates by six months, ultimately guiding policy for sustained post-COVID care in understudied areas like southern Punjab (10, 16).

CONCLUSION

This descriptive cross-sectional study at Sheikh Zayed Hospital, Rahim Yar Khan, found that 28.89% of 225 COVID-19 survivors experienced persistent dyspnea, 15.11% reported chronic cough, and 28.00% had pleuritic chest pain 3 to 5 years post-admission, with older age and lower education significantly predicting higher dyspnea and cough severity, and female gender linked to increased pleuritic pain severity, highlighting a substantial long-term respiratory burden in this Pakistani cohort; these findings underscore the clinical need for targeted screening and pulmonary rehabilitation programs for high-risk groups, particularly older, less-educated females, and advocate for future longitudinal research with imaging and biomarkers to elucidate mechanisms and evaluate interventions, addressing critical gaps in post-COVID care in resource-constrained settings.

REFERENCES

1. World Health Organization. WHO Coronavirus (COVID-19) Dashboard [Internet]. 2025 [cited 2025 Oct 12]. Available from: https://covid19.who.int
2. Desai AD, Lavelle M, Boursiquot BC, Wan EY. Long-Term Complications of COVID-19. Am J Physiol Cell Physiol. 2022;322(1):C1-C11.
3. Lopez-Leon S, Wegman-Ostrosky T, Perelman C, Sepulveda R, Rebolledo PA, Cuapio A, Villapol S. More Than 50 Long-Term Effects of COVID-19: A Systematic Review and Meta-Analysis. Sci Rep. 2021;11(1):16144.

4. Awan HA, Sahito AM, Sukaina M, Khatri G, Waheed S, Sohail F, Hasan MM. Tuberculosis Amidst COVID-19 in Pakistan: A Massive Threat of Overlapping Crises for the Fragile Healthcare Systems. Epidemiol Infect. 2022;150:e41.
5. Nasir N, Farooqi J, Mahmood SF, Jabeen K. COVID-19-Associated Pulmonary Aspergillosis (CAPA) in Patients Admitted with Severe COVID-19 Pneumonia: An Observational Study from Pakistan. Mycoses. 2020;63(8):766-770.
6. Soriano JB, Murthy S, Marshall JC, Relan P, Diaz JV. A Clinical Case Definition of Post-COVID-19 Condition by a Delphi Consensus. Lancet Infect Dis. 2022;22(4):e102-e107.
7. Cecchetto A, Guarnieri G, Torreggiani G, Vianello A, Baroni G, Palermo C, et al. Dyspnea in Post-Acute COVID-19: A Multi-Parametric Cardiopulmonary Evaluation. J Clin Med. 2023;12(14):4658.
8. Rai DK, Sharma P, Karmakar S, Thakur S, Ameet H, Yadav R, et al. Approach to Post COVID-19 Persistent Cough: A Narrative Review. Lung India. 2023;40(2):149-154.
9. Al-Jahdhami I, Al-Naamani K, Al-Mawali A, Bennji SM. Respiratory Symptoms After COVID-19. Oman Med J. 2022;37(1):e343.
10. Choi Y, Kim HJ, Park J, Lee M, Kim S, Koyanagi A, et al. Acute and Post-Acute Respiratory Complications of SARS-CoV-2 Infection: Population-Based Cohort Study in South Korea and Japan. Nat Commun. 2024;15(1):4509.
11. Wang CC, Prather KA, Sznitman J, Jimenez JL, Lakdawala SS, Tufekci Z, Marr LC. Airborne Transmission of Respiratory Viruses. Science. 2021;373(6558):eabd9149.
12. Iqbal N, Khanum I, Zubair S, Ali MI, Riaz U, Irfan M, et al. Post COVID-19 Pulmonary Complications, an Experience from Tertiary Care Hospital Karachi Pakistan. Eur Respir J. 2021;58(65):PA297.
13. World Health Organization. WHO Coronavirus (COVID-19) Dashboard: South-East Asia Region [Internet]. 2025 [cited 2025 Oct 12]. Available from: https://covid19.who.int/region/searo/country/in
14. American Lung Association. Chronic Cough [Internet]. 2025 [cited 2025 Oct 12]. Available from: https://www.lung.org/lung-health-diseases/lung-disease-lookup/chronic-cough
15. Romero-Duarte Á, Rivera-Izquierdo M, Guerrero-Fernández de Alba I, et al. Sequelae, Persistent Symptomatology and Outcomes After COVID-19 Hospitalization: The ANCOHVID Multicentre 6-Month Follow-Up Study. BMC Med. 2021;19(1):129.
16. Agarwal AK, Raja A, Brown BD. Modified MRC Dyspnea Scale [Internet]. Bethesda (MD): National Center for Biotechnology Information; 2022 [cited 2025 Oct 12]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559281/figure/article-26083.image.f5/
17. Cirino E. Pain Scale [Internet]. Healthline Media; 2018 [cited 2025 Oct 12]. Available from: https://www.healthline.com/health/pain-scale
18. Wang Z, Wang M, Wen S, Yu L, Xu X. Types and Applications of Cough-Related Questionnaires. J Thorac Dis. 2019;11(10):4379-4388.
19. Johns Hopkins Medicine. Pulmonary Function Tests [Internet]. 2019 [cited 2025 Oct 12]. Available from: https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/pulmonary-function-tests
20. Anayat A, Naz M, Amjad S, Tanveer H, Fakhr F. Post COVID-19 Complications of Symptomatic and Asymptomatic Among Healthcare Professionals Working in Tertiary Care Hospital of Lahore Pakistan. Pak J Med Health Sci. 2022;16(8):521-525.
21. Ashton R, Ansdell P, Hume E, Maden-Wilkinson T, Ryan D, Tuttiett E, et al. COVID-19 and the Long-Term Cardio-Respiratory and Metabolic Health Complications. Rev Cardiovasc Med. 2022;23(2):53.
22. Ayub Baig MM, Adnan M, Baig MU, Ramzan Z. Late-Onset Pulmonary Complications Among Survivors of Coronavirus Disease 2019. Pak J Med Sci. 2023;39(4):1094-1098.
23. Biswas S. Pulmonary Features of Long COVID-19: Where Are We Now? J Clin Oncol Rep. 2023;1(1):007.
24. Cha MJ, Solomon JJ, Lee JE, Choi H, Chae KJ, Lee KS, et al. Chronic Lung Injury After COVID-19 Pneumonia: Clinical, Radiologic, and Histopathologic Perspectives. Radiology. 2024;310(1):e231643.
25. Daines L, Zheng B, Pfeffer P, Hurst JR, Sheikh A. A Clinical Review of Long-COVID With a Focus on the Respiratory System. Curr Opin Pulm Med. 2022;28(3):174-179.
26. González J, Zuil M, Benítez ID, de Gonzalo-Calvo D, Aguilar M, Santisteve S, et al. One Year Overview and Follow-Up in a Post-COVID Consultation of Critically Ill Patients. Front Med. 2022;9:897990.
27. Imran M, Uddin A, Iqbal Z, Ali Y, Jalil Khan A. Long-Term Outcomes of COVID-19 Patients Admitted to a Tertiary Care Hospital in Peshawar, Pakistan. Eur Respir J. 2023;62(Suppl 67):PA4557.
28. Iqbal N, Khanum I, Kazi MAI, Riaz SU, Khawaja UA, Awan S, et al. Post COVID-19 Sequelae of the Respiratory System: A Single Center Experience Reporting the Compromise of the Airway, Alveolar and Vascular Components. Monaldi Arch Chest Dis. 2022;92(4):2412.
29. Javaria M, Asif N, Azhar N, Khawaja M. Clinical Long-Term Complications of Post COVID Time in Patients Reporting at PAF Hospital Within 3 Months After Discharge. Indus J Biosci Res. 2025;3(5):220-224.
30. Lee JH, Yim JJ, Park J. Pulmonary Function and Chest Computed Tomography Abnormalities 6-12 Months After Recovery from COVID-19: A Systematic Review and Meta-Analysis. Respir Res. 2022;23(1):233.
31. Montani D, Savale L, Noel N, Meyrignac O, Colle R, Gasnier M, et al. Post-Acute COVID-19 Syndrome. Eur Respir Rev. 2022;31(163):210185.
32. Murphy MC, Little BP. Chronic Pulmonary Manifestations of COVID-19 Infection: Imaging Evaluation. Radiology. 2023;307(2):e222379.
33. Oliveira RKF, Nyasulu PS, Iqbal AA, Hamdan Gul M, Ferreira EVM, Leclair JW, et al. Cardiopulmonary Disease as Sequelae of Long-Term COVID-19: Current Perspectives and Challenges. Front Med. 2022;9:1041236.
34. Shivani F, Kumari N, Bai P, Rakesh F, Haseeb M, Kumar S, et al. Long-Term Symptoms of COVID-19: One-Year Follow-Up Study. Cureus. 2022;14(6):e25937.
35. Sirayder U, Inal-Ince D, Kepenek-Varol B, Acik C. Long-Term Characteristics of Severe COVID-19: Respiratory Function, Functional Capacity, and Quality of Life. Int J Environ Res Public Health. 2022;19(10):6304.
36. Stewart I, Jacob J, George PM, Molyneaux PL, Porter JC, Allen RJ, et al. Residual Lung Abnormalities After COVID-19 Hospitalization: Interim Analysis of the UKILD Post-COVID-19 Study. Am J Respir Crit Care Med. 2023;207(6):693-703.
37. Tarraso J, Safont B, Carbonell-Asins JA, Fernandez-Fabrellas E, Sancho-Chust JN, Naval E, et al. Lung Function and Radiological Findings 1 Year After COVID-19: A Prospective Follow-Up. Respir Res. 2022;23(1):242.

38. Wanjari M, Late S, Sharma R, Munjewar P. Long-Term Pulmonary and Extra-Pulmonary Consequences of COVID-19: A Comprehensive Review of Current Evidence and Future Perspectives. Narra J. 2023;3(2):e156.
39. Yang T, Yan MZ, Li X, Lau EHY. Sequelae of COVID-19 Among Previously Hospitalized Patients Up to 1 Year After Discharge: A Systematic Review and Meta-Analysis. Infection. 2022;50(5):1067-1109.