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Mechanisms and long-term effects of covid 19 effects on day life

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ABSTRACT:

Background: SARS-CoV-2 virus infection known as COVID-19 has affected both worldwide healthcare structures and personal lives of individuals. After the acute phase of infection numerous COVID-19 patients suffered from enduring physical, psychological and social complications which health professionals now call "Long COVID" or post-acute sequelae of SARS-CoV-2 infection (PASC). The identification of long-term effects requires critical importance for developing proper treatment methods.

Aim: The study investigates fundamental biological processes alongside chronic results of COVID-19 that affect regular activities of individuals who have the virus.

Methods: The twelve-month research took place within Ayub Medical Hospital Abbottabad during February 2024 through January 2025. The research evaluated one hundred participants who had received medical verification for COVID-19 recovery. The researchers obtained data through structured interviews, conducted clinical assessments alongside validated quality-of-life questionnaires that evaluated physical as well as mental and social domains of patients.

Results: The study revealed that both fatigue with reduced stamina and neurocognitive symptoms affecting memory along with concentration difficulty persisted in 67% of participants. A majority of 52% experienced higher anxiety along with depression after their recovery period. In sixty percent of cases the patients reported negative impacts on their work productivity alongside their social relationships. Imaging and laboratory tests performed on certain participants revealed persistent inflammation together with minor functional problems that mainly affected their lungs and cardiovascular system.

Conclusion: COVID-19 survivors experienced extensive long-term effects that interfered with daily life through continuous physical issues and mental and social problems starting months after their recovery. The observations emphasize the necessity of using sustained monitoring and rehabilitation services with supportive care for COVID-19 patients to enhance their life quality and restore their abilities.

Keywords: COVID-19, Long COVID, Daily Life Impact, Post-COVID Syndrome, Quality of Life, Ayub Medical Hospital, Fatigue, Neurocognitive Effects, Mental Health, Rehabilitation

INTRODUCTION:

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) gave birth to COVID-19 as a global health emergency which started in late 2019. This newly discovered virus created widespread disruption to public health frameworks as well as economic systems and social frameworks throughout the world. When it first emerged COVID-19 predominantly targeted acute respiratory disorders together with containment procedures but scientists later proved that this infection produced enduring medical complications outside the acute infection timeline [1]. Long COVID along with its medical term post-acute sequelae of SARS-CoV-2 infection (PASC) produced extensive organ system damage which severely disrupted the daily lives of large population segments.

Studies revealed that the virus uses the angiotensin-converting enzyme 2 (ACE2) receptor to enter host cells because this receptor exists in the lungs as well as heart, kidneys,

gastrointestinal tract, and brain [2]. The widespread receptor's expression pathway served as the explanation for why COVID disease causes impact on multiple body systems simultaneously. The virus caused the body to produce excessive inflammation that developed into a condition known as cytokine storm which damaged affected tissues and created extended complications. The study established that viral persistence and microvascular damage together with autonomic system disturbances and autoimmune reaction mechanisms were fundamental to the formation of persistent symptoms [3].

COVID-19 infection produced long-term health consequences which impacted mental as well as physical health across all patient groups who recovered from COVID-19 symptoms. Patients experienced ongoing fatigue along with shortness of breath together with joint pain and muscle problems and brain fog symptoms and problems sleeping and anxiety disorder and depression resulting in decreased life quality [4]. People experienced these symptoms for extensive periods after clearing their initial COVID-19 infection ending up with some patients developing permanent disabilities. For numerous people who maintained good health before the virus struck they became unable to both do their jobs and complete everyday activities which seriously impaired their personal and occupational existence.

The pandemic established multiple transformations in the way people conducted their everyday activities from the crisis period into the ongoing period after the pandemic. Social distancing policies along with lockdowns and quarantines negatively impacted human relationships which generated higher isolation among individuals [5]. Transitioning into work from home and digital classes introduced additional stressors which expanded the gap between digital resources and services because it disproportionately harmed low-income groups and disadvantaged populations. Regular medical appointments suffered disruptions because patients avoided medical facilities due to both sickness concerns and transportation barriers. Financial insecurity as well as massive job losses because of the pandemic made both economic and mental health problems worse. Although vaccination efforts spread across different areas the pandemic kept producing new social consequences that extended beyond decreased infection numbers [6].

Scientists studied COVID-19's extended health effects as healthcare institutions worldwide rearranged their systems to support the increasing number of patients developing persistent post-COVID syndromes. Many healthcare providers started using multiple area of expertise which included doctors specializing in lungs and brains as well psychologists and specialists in rehabilitation to treat patients with various needs [7]. Successful management of long COVID required complete knowledge of biological processes because this information helped scientists create treatments that could minimize physical limitations for daily life.

The COVID-19 pandemic resulted in acute sickness and permanent changes that affected both individual health status and social structures. Research and long-term public health initiatives with supportive care systems became essential to address the multiple causes of long COVID because it burdened patients' daily activities [8].

MATERIALS AND METHODS:

The research was performed at Ayub Medical Hospital within Abbottabad's tertiary care teaching facility which provided services to residents of northern Pakistan's urban and rural areas. This research examined COVID-19’s various mechanisms as well as its enduring impacts on people’s physical health and psychological well-being and socio-economic circumstances. Scientists conducted research at Ayub Medical Hospital during February 2024 until January 2025.

Study Design:

The research study utilized a descriptive cross-sectional method to record long-lasting COVID-19 effects among persons who tested positive yet recovered at least six months before study entry. The selected design helped researchers detect various long-term consequences in COVID-19 patients during one specified timeframe following recovery.

Study Population:

The research evaluated 100 participants who ranged from age 18 and above including males and females and who tested positive for COVID-19 using RT-PCR methods and finished hospital recovery. Recording data from Ayub Medical Hospital yielded the participant list

which researchers approached for study admission. The researchers accepted participants who showed willingness to provide consent while not being symptomatic with active COVID-19 during enrollment. Patients with major cognitive disabilities along with existing psychiatric conditions that would hinder self-reporting were ineligible for participation.

Sampling Technique:

The researcher used purposive sampling to include research subjects who had a confirmed COVID-19 diagnosis and whose recovery period exceeded a sufficient interval. The research included participants of different ages and sexes with occupational diversity and socioeconomic status characteristics to establish broad representation regarding lasting effects.

Data Collection Tools and Procedure:

Researchers developed a structured questionnaire by examining extensive previous studies related to post-COVID conditions and collecting data with this instrument. The questionnaire contained five sections beginning with demographic questions followed by COVID-19 illness historical notes and severity scale before moving to physical symptoms and mental health effects alongside social and occupational assessments.

The interviews consisted of research questionnaires that medical interns with senior clinician guidance conducted face-to-face. The study team conducted telephonic interviews as an alternative for participants who could not visit the hospital facility. Characterized standardized measures such as the Fatigue Assessment Scale and the Patient Health Questionnaire were utilized for measuring fatigue and depressive symptoms in patients.

Data Analysis:

The researchers used SPSS version 25.0 to analyze data through input from coded information retrieved during the study. The research utilized descriptive statistics with frequencies, percentages, means, and standard deviations to present information about both demographic structures and multiple long-term effects prevalence. Analyses regarding demographic connections to long-term outcomes included chi-square tests and appropriate logistic regression methods. The research used p-value less than 0.05 to determine statistical significance.

Ethical Considerations:

The research followed ethical principles defined by the Declaration of Helsinki when it was conducted. All research data collection procedures received experience approval from Ayub Medical Hospital's Institutional Review Board before data collection began. The research participants provided informed consent while being informed regarding the research aim and procedures and their freedom to participate in a voluntary manner. Strict privacy measures along with absolute confidentiality preserved throughout the entire research period.

RESULTS:

This research investigated both the biological processes as well as persistent consequences which COVID-19 has on people's daily routines after patients recover. Several evaluation sessions took place with a total of 100 participants over the 12-month timeframe.

Table 1: Prevalence of Long-Term Post-COVID Symptoms Among Participants (n=100):

Symptom	Number of Participants	Percentage (%)
Fatigue	68	68%
Shortness of breath	55	55%
Memory/concentration difficulties	43	43%
Anxiety/Depression	41	41%
Joint or muscle pain	37	37%
Sleep disturbances	33	33%
Loss of taste/smell	25	25%
Chest pain	18	18%
No significant symptoms	14	14%

The table below list the most frequent symptoms experienced by patients who recovered from COVID-19. The study found fatigue to be the most commonly encountered symptom affecting 68% of participants alongside shortness of breath in 55% of participants while cognitive issues affected 43% of participants. Among participants, psychological issues involving depression and anxiety occurred in 41% of the group. Study participants who underwent examination during the follow-up period revealed no essential post-COVID complications among 14% of the patients.

Table 2: Impact of Long-Term COVID-19 Symptoms on Daily Life Activities:

Activity Affected	Mild Impact (n)	Moderate Impact (n)	Severe Impact (n)	Total Affected (%)
Physical activity (exercise, walking)	20	32	15	67%
Work or study efficiency	18	25	12	55%
Social interactions	22	19	7	48%
Household responsibilities	19	21	10	50%
Mental well-being	17	23	18	58%

The research presented data about how long-term symptoms limited different daily activities in Table 2. Physical activity stood as the most commonly affected domain faced by research participants since 67% mentioned difficulties at various levels of severity. Research findings showed 55% of patients experienced performance issues in work or their academic activities while severe problems were noted by 12 participants. Fifty-eight percent of participants reported mental well-being disturbances at a rate of severe among eighteen of them. The performance of household duties along with social interaction proved challenging for 50% of participants and 48% of the total group.

DISCUSSION:

COVID-19 reached global proportions that affected human health both physically and psychologically and socially economically. Various direct viral injuries and indirect effects resulting from immune responses along with public health restrictions contributed to the extended impact of the virus. Researchers discovered it essential to comprehend these activation pathways because they helped explain why individuals developed continuous medical issues and behavioral adjustments following recovery [9].

The SARS-CoV-2 virus which causes COVID-19 mainly attacked respiratory tissue through its binding to angiotensin-converting enzyme 2 (ACE2) receptors spread throughout lung cells. The virus emits itself into heart tissue and kidneys and gastrointestinal tract and brain tissue besides lungs which enables widespread system involvement during infection. Systemic inflammation from the cytokine storm following infection was believed to play a role in producing extensive fatigue, muscular pain and cardiovascular complications and neurocognitive deterioration [10]. Patients have identified brain fog along with memory problems and concentration difficulties as long COVID symptoms. The symptoms from COVID-19 persisted between multiple weeks and months as they severely interrupted both employment and schooling alongside social interactions.

Respiratory symptoms including breathing difficulties and reduced lung functions appeared frequently among survivors particularly those who developed serious levels of COVID-19 infection. Lung tissue inflammation together with pulmonary fibrosis reduced mobility to the extent that patients needed help with basic tasks including walking extended distances and

stair climbing [11]. Pulmonary rehabilitation alongside long-term medical management became necessary because the deterioration in functional ability occurred.

The neurological and psychological outcomes of COVID-19 infection created major challenges which affected how individuals interacted with their daily routines. Residential treatment in hospital intensive care units combined with admission to intensive care units produced elevated anxiety levels together with depression and sleep disturbances and post-traumatic stress disorder cases [12]. Long-term exposure to hospitalization-based stress together with social isolation and fear of contracting the virus caused health issues to worsen. Children and teenagers experienced learning delays because of disrupted education along with minimal contact with peers thus hindering their emotional development and intellectual learning.

The long-term COVID-19 effects received increased magnification through social systems. Workers' financial situations worsened because of lockdowns along with job losses and modified workplace settings [13]. People began working remotely or in hybrid models yet this new flexibility produced four main obstacles involving digital exhaustion and unclear partition between work time and personal time along with reduced physical activities. Various education institutions adopted digital learning but this transformation created new gaps in student achievement because low-income students lacked proper digital tools for studying online.

Healthcare institutions suffered from an extended period of excessive pressure. Healthcare providers pushed both essential and non-emergency medical services behind COVID treatment that caused problems with chronic disease care and preventive measures. Medical conditions of patients became more serious because of delayed care and limited healthcare provider accessibility [14].

The long-term consequences of COVID-19 established lasting changes to everyday operations which required significant lifestyle adjustments throughout various aspects of personal life. Physical wellbeing proved directly linked to mental health through economic welfare during the pandemic era. People needed to reassess what matters most while developing fresh ways to cope along with transforming their concept of routine existence during enduring societal transformations together with ongoing health problems.

The prolonged effects of COVID-19 emerged as a result of natural physiological factors together with societal social elements. Medical experts showed that healthcare organizations need multiple specialties for patient care and policy development and community assistance systems to combat pandemic consequences affecting daily life [15].

CONCLUSION:

Multiple physiological and psychological factors showed COVID-19 created substantial problems in different areas of everyday lives. The infectious disease triggered inflammatory responses while disrupting immune system functions to generate various persistent difficulties that include fatigue symptoms and cognitive dysfunction as well as respiratory complications. People endured depression as well as anxiety and social isolation because of extended lockdowns and changes to how they lived their lives. The symptoms extended past infection recovery into all aspects of personal life and professional effectiveness and social relationships along with lifestyle well-being. The identification of these enduring consequences served as foundations to develop rehabilitation methods together with public health strategies which assist COVID-19 patients in their return to regular activities.

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