



DEMYSTIFYING LONG COVID

INTERNATIONAL CONFERENCE 2024

ABSTRACT BOOK

International Conference - Demystifying Long COVID 2024
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ORAL ABSTRACT PRESENTATIONS

**Demystifying Long COVID International
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1

Clinical Insights From a Pediatric Long COVID Clinic

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Background: Long COVID or post-acute sequelae of SARS-CoV-2 infection is a persistent condition following acute SARS-CoV-2 infection, affecting both adults and children. However, studies exploring the clinical spectrum and the impact of vaccination on long COVID in children remain limited.

Methods: We conducted a retrospective chart review and data analysis of children aged 0-21 years who were seen at the long COVID clinic at Children's Hospital Los Angeles between August 2021 and November 2023. All statistical analyses were performed using R Studio 4.2.2.

Results: The study included 123 patients with a mean age of 13.1 years, of whom 63 (51.2%) were male. The mean onset of symptoms occurred 5 weeks after SARS-CoV-2 infection, with an average symptom duration of 31.3 weeks at presentation. Notably, 23 patients (18.6%) experienced symptoms lasting over 12 months. The most commonly reported symptoms were fatigue (92.7%), headache (69.9%), exercise intolerance (52.8%), dizziness (43.9%), and brain fog (40.7%). Fatigue and headache were the most reported symptoms across different age groups. Males and females did not vary significantly in duration of symptoms on presentation ($p=0.8$). However, females were more likely to experience brain fog ($p=0.04$), dizziness ($p<0.001$), palpitations ($p<0.001$), and have a diagnosis of POTS ($p=0.05$). Among 74 patients with at least one follow-up visit, a general decrease in symptom severity was observed over time. No significant difference was found in the mean number of symptoms at 6 or 12 months between vaccinated and unvaccinated groups. Of the 43 patients vaccinated after the onset of long COVID, 19 (44.2%) reported subjective improvement.

Conclusion: Fatigue and headache are the most prevalent symptoms of long COVID in pediatric patients across various age groups. A reduction in symptom burden was observed over time, and vaccination appears to have a beneficial effect in alleviating long COVID symptoms in some children. A systematic assessment that accounts for confounding factors and other interventions will be necessary to accurately determine the vaccine's contribution. Larger studies with extended follow-ups are necessary to further validate these findings.



2

Impact of Persistent Symptoms on Quality of Life in Long COVID Patients: A Comparative Study

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Background: Long COVID, or Post COVID-19 condition, is characterized by a wide range of persistent symptoms that affect patients long after their acute COVID-19 infection. These lingering symptoms have been shown to significantly impact the quality of life (QoL). The objective of this study was to describe the sociodemographic and clinical characteristics of Long COVID patients, compare them with patients who experienced acute COVID-19 without lasting sequelae, and identify key factors associated with decreased QoL in Long COVID patients.

Materials and Methods: This descriptive, cross-sectional study analyzed a sample of 170 patients, with 85 patients in the Long COVID group and 85 in the acute COVID group, using data from the ARALONGCOV study. Sociodemographic and clinical variables were compared between groups through bivariate analysis. The QoL was assessed using the SF-12 questionnaire, while parametric statistical tests were employed for normally distributed variables. A multivariate linear regression model was used to explore the association between persistent symptoms, such as fatigue, cognitive dysfunction, and neurological symptoms, and their impact on QoL.

Results: The most common symptoms in the Long COVID group were fatigue (91%), cognitive impairments (90.6%), myalgia (78.8%), dyspnea (76.5%), and neurological disturbances (76.5%). The Long COVID group reported a significantly lower QoL, with an average SF-12 score of 31.64, compared to 68.67 in the acute COVID group. The multivariate regression analysis identified a significant relationship between the frequency of myalgia, cognitive symptoms, and neurological issues, and a poorer QoL. Interestingly, the

duration of cognitive symptoms was paradoxically associated with a slightly improved QoL.

Conclusions: Patients with Long COVID exhibit substantially lower QoL compared to those with acute COVID without sequelae. Frequent myalgia, cognitive impairments, and prolonged neurological symptoms are key factors contributing to this decline. These findings highlight the urgent need for targeted, long-term medical care and interventions tailored to the needs of Long COVID patients to address the specific symptoms contributing to decreased QoL.



3

Long COVID and Associated Outcomes Following COVID-19 Reinfections: Insights From an International Patient-Led Survey

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Background: COVID-19 reinfections are common worldwide. Long COVID is a serious infection-associated chronic condition and a major public health concern. Using a patient-centered approach, we characterized the association between reinfections and Long COVID.

Material and Methods: We developed and disseminated internationally a patient-centered online survey examining the outcomes of COVID-19 reinfections. The survey incorporated validated instruments on fatigue, post-exertional malaise, and physical function with questions about COVID-19 infection history, vaccination, and Long COVID symptoms, including symptoms related to immune and reproductive health. We tested whether the likelihood of Long COVID and related outcomes increases with COVID-19 infection numbers.

Results: Here we show that reinfections increase the likelihood of reporting Long COVID. Among 3,382 participants, 22% reported never having had COVID-19, 42% experienced it once, and 35% reported reinfections. Relative to those who did not report infections or experienced COVID-19 once, reinfections were associated with increased likelihood of reporting severe fatigue, post-exertional malaise, decreased physical function,

poorer immune health, symptom exacerbation before menstruation. People who experienced reinfections were more likely to report delayed recovery from exertion. Relative to one COVID-19 infection, reinfections were associated with higher odds of reporting cramping, heavy bleeding, bleeding with clots, and abdominal pain during menstruation. Relative to those with one infection, COVID-19 reinfections were associated with a further increase in the odds of 50 out of the 67 surveyed symptoms. While vaccinations and boosters prior to infection are associated with lower likelihood of Long COVID, reinfections diminish their protective effect. The probability of reporting Long COVID remission is generally low (11.5%-6.5%).

Conclusions: COVID-19 reinfections are associated with higher likelihood of Long COVID and related outcomes. Our findings are supported by studies based on EHR and observational cohort data reporting that COVID-19 reinfections are linked to increased risk of Long COVID and related multisystem sequelae. These findings underscore the need for robust public health measures for COVID-19 infection prevention and the importance of considering reinfections in Long COVID research and clinical practice.



4

An Innovative Digital Health Solution to Address Unmet Needs in Long COVID: Results From the Co-design Study of the Long COVID Companion App

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Background: In the absence of Long COVID (LC) treatment, an app to monitor symptoms could support people with Long COVID (PWLC) in their daily lives. Only a few apps already exist for LC but are not widely available. In response to patients' needs, we co-developed a digital monitoring app available in Europe. Participatory research is essential to co-develop well-accepted new digital tools.

Methods: A collaboration was established between Apresj20 Association Covid Long France and the Luxembourg Institute of Health. Patient representatives and healthcare professionals (HCPs) were involved in each research process step, as co-researchers. A mixed-methods study was implemented to assess the needs, expectations, fears, barriers, and preferences regarding a digital tool to monitor their health. Feedback loops were used to develop the app's first version, to validate the content, design, and app features. PWLC were invited to test the beta version and their feedback was collected to identify potential bugs and improvement suggestions.

Results: The mixed-methods study included 216 participants in a web-based survey and 20 participants in individual interviews. Expectations regarding a digital health app were to improve disease management, quality of life, and communication between PWLC and HCPs. Fears and barriers were related to confidentiality, accessibility, and the risk of post-exertional malaise. The expected app features were 1/ Regular monitoring of LC symptoms over time, 2/

Medical and daily life diary, 3/ Information on LC and advice to manage symptoms, and 4/ Contribution to research on Long COVID and potential vocal biomarkers. Based on these results, the Long COVID Companion web app was co-designed and released in April 2024, available for free in 3 languages (French, English, and German). As of June 24th 2024, the app counted 824 users, 3600 standardized questionnaires were completed and more than 35000 individual symptoms were reported.

Conclusion: This study resulted in the Long COVID Companion app, one of the first apps dedicated to Long COVID and co-designed for and with its end-users through a rigorous research study. Long COVID Companion app provides daily support to PWLC to cope with their disease and ultimately improves their quality of life.



5

Persistent Immune Dysregulation and Metabolic Alterations Following SARS-CoV-2 Infection

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Background: Long COVID (LC) presents as a heterogeneous, multisystem condition encompassing a wide range of symptoms, including fatigue, cognitive impairment, and post-exertional malaise and affects approximately 7% of persons infected with SARS-Cov2. While several mechanisms of LC have been proposed, the biological drivers are not clearly understood.

Methods: In the present study, we performed an in-depth immunometabolic screen with multidimensional flow cytometry and plasma measurements of soluble biomarkers and metabolites, to compare individuals who did (N=96) or did not (N=30) have COVID-19, or who had COVID-19 and did (N=58) or did not (N=38) develop LC.

Results: Compared to uninfected controls, those who had had COVID-19 had an altered metabolic and inflammatory profile at approximately four months post-COVID, mostly irrespective of the development of LC symptoms. Post-COVID, we observed sustained inflammasome activity and oxidative stress in monocytes along with an enrichment in immature monocytes. This was accompanied by elevated inflammatory plasma biomarkers, including lipid mediators, decreased tryptophan levels, and alterations in the frequency and phenotype of peripheral immune cells. In comparison to recovered COVID-19 participants, we identified a distinct subset of senescent effector CD8 T-cells in individuals who developed LC, characterized by lower expression of CD57, an indicator of cytotoxic capacity, and higher levels of p16INK4a, a cellular senescence marker.

Conclusion: Collectively, we show that acute SARS-CoV-2 can have a profound and sustained immunologic effect, and that among those who had been infected, a combination of disjointed innate and adaptive immune recovery and metabolic alterations contribute to LC. These insights could inform targeted therapeutic strategies aimed at modulating specific immune or metabolic pathways implicated in the persistence of LC symptoms.



6

Unraveling the Molecular Signature of Long COVID with Post-Exertional Fatigue: An Analysis of Circulating Proteomic and Metabolomic Profiles

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Introduction: Post-exertional malaise (PEM) is a highly disabling condition characterized by worsened symptoms after mental or physical exertion and is commonly reported in Long-COVID (LC). Its underlying pathophysiology is unclear, but potential mechanisms include mitochondrial dysfunction, oxidative stress, and metabolic derangements. We conducted a multiomic analysis to identify changes in energy metabolism, immune function, and cellular stress responses in patients with LC affected by PEM (LC-PEM).

Methods: We included 25 LC-PEM and 25 COVID-19 survivors without persistent symptoms (Recovered) matched by sex, age and COVID-19 severity. We detected the levels in plasma of 6 short-chain fatty acids (SCFA) by GC-MS/MS, 95 metabolites by GC-qTOF and 795 proteins in the proteomic analysis by nanoLC-MS/MS. Statistical analyses included t-tests, partial-least square discriminant analysis (PLS-DA), Random Forest, and Joint-Pathway analyses (KEGG database).

Results: Acetic acid was the only SCFA with significantly lower levels in the LC-PEM group ($p=0.001$). Metabolomics revealed 29 differentially expressed metabolites between groups (23 increased, 6 decreased in LC-PEM, all $p<0.04$). Proteomics showed 51 differentially expressed proteins between LC-PEM and recovered groups

(39 increased and 11 decreased, $p<0.01$ in all cases). In a multiomic analysis, the PLS-DA of the identified 81 significant compounds demonstrated clear differences between groups. The enrichment pathway analysis of these 81 molecules identified 25 affected pathways, including complement and coagulation cascades, glucagon signalling pathway, TCA cycle, Pyruvate metabolism, Fatty acid biosynthesis, different amino acid metabolisms, Glycolysis/Gluconeogenesis, HIF-1 signalling pathway, Butanoate metabolism and Glyoxylate and dicarboxylate metabolism. Random Forest highlighted glyceraldehyde-3-phosphate dehydrogenase, Protein S100-A9, Fumaric acid and Galectin-3-binding protein as most associated with LC-PEM. ROC curves of these 4 compounds identified Protein S100-A9 as the best differentiator between LC-PEM and recovered groups (AUC, 0.8721 95% CI= 0.775-0.969, $p<0.001$)

Conclusions: Coagulation and inflammatory problems associated with metabolic changes, including upregulation of glycolysis and fatty acid synthesis are associated with LC-PEM. These findings suggest the need for a multifaceted approach to managing LC-PEM, addressing both the metabolic and immunological aspects of the condition. Future research should focus on validating these biomarkers in larger cohorts and exploring targeted treatments to address the identified metabolic and inflammatory imbalances.



7

Sub-maximal 2-day Cardiopulmonary Exercise Testing to Assess Exercise Tolerance and Symptom Responses in People with Long COVID

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Background: Long COVID describes a persistent and episodic pathophysiological condition with a broad symptom presentation profoundly impacting quality of life. The prevalence of post-exertional malaise (PEM) is well established; however, the exact mechanisms require examination. Accordingly, we investigated the physiological basis of PEM in patients with Long COVID using two-day submaximal cardiopulmonary exercise testing (CPET).

Material and Methods: Fifty-four participants (age [mean ± SD] 51 ± 11 years, 37 females [68.5%]) who met the WHO Long COVID definition were screened for severity of PEM and completed two-day submaximal CPET separated by 24-hours. Exercise intensity was stratified relative to functional status determined by the six-minute walking test at baseline. Protocols began at either 10, 20 or 30 watts (W) on a cycle ergometer increasing at 5W per minute for a maximum of 12-minutes. Strict test criteria were implemented and included stopping tests in the event of observed changes in vital signs and reports of dizziness, sickness, symptom exacerbation and patient volition. Patients were remotely monitored for PEM following completion of the study using a bespoke app allowing them to report incidence of symptom exacerbation. Paired samples T-tests

were conducted comparing measures between CPET days using SPSS with a set α level of 0.05.

Results: Impaired oxygen consumption at the first ventilatory threshold during cycle exercise that worsens on Day 2 was found (Day 1 vs. Day 2 [N=30]; 10.1 ± 2.2 vs. 9.5 ± 2.3 mL/kg/min; p=0.007). A reduction in workload (Day 1 vs. Day 2 [N=30]; 28 ± 13 vs. 23 ± 13 W; p<0.05) and oxygen pulse (Day 1 vs. Day 2 [N=30]; 8.4 ± 2.4 vs. 7.6 ± 1.8 mL/bpm; p=0.01) at the first ventilatory threshold was also observed on Day 2. No severe adverse events were reported.

Conclusions: Impaired oxygen consumption and workload at the first ventilatory threshold that worsens on the second exercise day is indicative of inappropriate transport and/or utilisation of oxygen, and an impaired ability to recover from exercise on day one. Furthermore, a reduction in O₂ pulse is suggestive that a reduction in stroke volume and/or mitochondrial function contributes to PEM.



8

Normalization of Cognitive Function in Patients With Neurological Symptoms Post COVID-19 After 12 Months

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Background: Despite cognitive symptoms being one of the core symptoms in the post COVID condition, there is a lack of knowledge of long term trajectories and predictors for persistent cognitive impairment. Few studies have assessed patients longitudinally using standardized neuropsychological assessments, including a healthy control group and controlling for psychiatric diagnosis. The aim of this study is to assess cognitive functions in patients with neurological symptoms 6 (T1) and 12 (T2) months post COVID-19, and compare to SARS-CoV-2 negative healthy controls, to assess the change in cognitive function from T1 to T2 and explore predictors for a long-term cognitive outcome.

Material and Methods: 81 patients reporting neurological symptoms and 61 healthy controls from the Norwegian NeuroCOVID study were assessed with a comprehensive neuropsychological test battery covering the main cognitive domains (motor, processing speed, attention/working memory, verbal and visual memory, word fluency and executive function). Sixty-seven of the patients completed assessment at T2. Psychiatric diagnoses were assessed using the M.I.N.I. interview. We used statistical methods as appropriate and performed a multiple linear regression analysis with change in global cognitive index from T1 to T2 as the dependent variable and psychiatric disorder at T2 and delirium during COVID-19 as independent variables.

Results: At T1, patients performed significantly worse compared to controls on all cognitive domains, except for verbal fluency. At T2, there were no longer significant differences, except for verbal memory, and patients improved significantly from T1 to T2 in most cognitive domains. In a regression analysis 14.1 % of the variance in the change in global cognitive index was explained by delirium during COVID-19 and a psychiatric diagnosis at T2, with the latter being the strongest predictor.

Conclusions: Our results indicate a good prognosis concerning cognitive function 1 year after SARS CoV-2 infection. In patients who do not improve, clinicians should evaluate if the patient may have a psychiatric disorder, which if treated may improve cognitive function. Further studies into underlying biological mechanisms in the subgroup of patients with persistent cognitive impairment are warranted.



9

Plasma Biomarkers in Children and Young People With Long COVID

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Background: The emergence of SARS-CoV-2 infection during late 2019 became a pandemic in March 2020. SARS-CoV-2 is vastly known to cause COVID-19. Although most patients having this disease can recover, an important percentage can develop long-term persistent symptoms after the acute infection is resolved, a condition known as long COVID or Post-Acute Sequelae of SARS-CoV-2 (PASC). In this study we aim to characterize neuronal and vascular damage biomarkers together with autoantibodies and cytokines levels in plasma of children and young people (CYP) with and without PASC.

Material and Methods: We analysed 131 blood samples from the pediaCOVID cohort (Hospital Germans Trias i Pujol), which includes 108 CYP diagnosed with PASC and 23 controls. Autoantibodies against the M2 muscarinic and β_2 adrenergic G-protein coupled receptors (GPCRs) and the vascular damage biomarkers endothelin-1, angiotensin-2 and von Willebrand's Factor were measured in plasma through ELISA. Neuronal damage markers glial fibrillary acidic protein and neurofilaments were measured in plasma through SIMOA® Technology. Additionally, 42 inflammatory markers were measured in plasma by Luminex (HCYTOMAG-60K, Milliplex® Map Kit) and ELISA (Gal-9).

Results: CYP with PASC had increased levels of autoantibodies against the M2 muscarinic receptor ($p=0.01$) and of the inflammatory markers eotaxin, IL-15 and PDGF-AB ($p=0.03$, $p=0.04$, $p=0.03$

respectively) while showed decreased levels of RANTES (CCL5) ($p=0.01$) compared to the control group. Finally, there were no significant differences in both vascular and neuronal damage biomarkers between CYP with and without PASC.

Conclusions: These results demonstrates that CYP with PASC have inflammatory dysregulation and increased levels of autoantibodies, suggesting a potential role of the immune system in pediatric PASC. Interestingly, the M2 muscarinic GPCRs autoantibodies has already been shown to be increased in adults with PASC, suggesting a common link between pediatric and adult PASC physiopathology not shown before. Moreover, our results on vascular and neuronal damage biomarkers suggests that CYP with PASC had no vascular nor neuronal damage at 3 months after the acute infection. More comprehensive studies must be done to address the specific physiopathology of PASC and explore if the immune dysregulation is a consequence or a cause of this condition.



10

Anticoagulant and Antiviral Therapy in Long COVID: A Real-World Prospective Cohort Study and Grassroots Patient-Designed Trial

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Long COVID affects 400 million people worldwide, causing >1 trillion of economic damage. Diagnostic biomarkers and effective therapies are urgently needed for the millions of people currently living with Long COVID. Patients and patient organizations have moved from being consulted to taking the lead in clinical trial design and the search for treatments.

In a real-world cohort with long follow-up (a total of 220 person-years, n=110), we measured both patient- (COOP chart score ranging 0-30) and clinician-reported (Long Covid grade ranging 0-3) outcomes following first-line treatment with anticoagulants (Asaflow/Clopidogrel), and optional second-line treatment with antivirals (Paxlovid, Nirmatrelvir/Ritonavir). Out of 110 patients, 59 received anticoagulant treatment, 17 received antiviral treatment (14 after first-line anticoagulants), while 34 received neither. Significant clinical improvement was observed after antiviral treatment ($p < 0.05$ both COOP and LONG COVID grade) but not anticoagulant treatment.

Antiviral treatment was an independent predictor of both patient-and clinician-measured improvement (yes/no) in multivariate logistic regression (corrected for age, sex, vaccine doses, disease severity, number of acute infections and COVID wave/variant and first-line treatment). However, both anticoagulant and antiviral treatment were independent predictors of clinician-reported improvement in Long Covid grade by multivariable linear regression.

Paxlovid treatment had a significant impact on the whole blood transcriptome, with a concerted

increase in circulating mast cell precursors correlating to clinical outcome. However, antisense SARS-CoV-2 (our previously identified Long Covid biomarker) did not change upon treatment, which may help explain Paxlovid rebounds documented in both acute and long Covid.

In conclusion, clinical recovery in a real-world Long COVID cohort can be predicted by second-line antiviral treatment and first-line anticoagulant treatment, hinting at the possible benefit of combination treatment. This biomarker-guided study also reveals a putative role for circulating mast cells in Long Covid therapeutic response and/or clinical evolution.



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Exploring the Efficacy of Plasma Exchange Therapy in Post-COVID-19 Condition: A Pilot Randomized Double-Blind Trial

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Background: Post COVID-19 Condition (PCC) is estimated to affect 10-20% of COVID-19 survivors and can manifest with over 200 symptoms, including weakness, fatigue, impaired concentration, and breathlessness. Current understanding suggests that abnormal antiviral immune responses during acute infection, coupled with systemic immune perturbations, contribute to the proinflammatory status underlying PCC symptoms. The impact on functional disability, quality of life, and productivity is substantial, emphasizing the urgent need for effective interventions to prevent and cure PCC. We conducted this clinical trial to evaluate the efficacy and safety of Plasma Exchange (PE) as a potential treatment for PCC.

Methods: In a pilot, randomized, double-blind study we aim to compare the clinical and laboratory benefits of six sessions of PE vs Placebo in individuals with moderate-severe functional

disability due to PCC. The primary outcome measures include security and changes in symptoms severity, functional capacity, quality of life and neurocognitive profile. Secondary outcomes encompass laboratory parameters.

Results: From September to June 2023, 50 patients were enrolled in the study, receiving 6 sessions of PE (n=25) or Placebo (n=25). Mostly were female, 16(64%) in the PE group and 17(68%) in the Placebo group, with a mean age of 48(SD10.5) years. PE didn't demonstrate any significant difference comparing to Placebo. No differences were found in laboratory parameters (Figure1). Assessments of quality of life, symptomatology and neuropsychological scores didn't show improvements in patients who underwent PE compared to Placebo (Figure2). All participants exhibited at least 1 adverse event (AE), with 25(100%) in PE group and 22(88%) in Placebo group experiencing ≥ 3 AEs. 1(4.2%) severe AE occurred in the PE group. Infections were the most frequent AE, with 17(9%) cases in Placebo group and 14(5.9%) in PE group. Furthermore, 2 cases of SARS-CoV-2 reinfection were described in Placebo group.

Conclusions: PE administered over six sessions didn't provide significant benefits in managing PCC. Despite observed AEs, PE appeared safe, with mostly mild effects. Effective treatments for PCC remain elusive, underscoring the need for further randomized and double-blind clinical trials to advance towards a cure for PCC or mitigate its effects.



POSTER ABSTRACT PRESENTATIONS

**Demystifying Long COVID International
Conference 2024**

Hybrid Meeting

21 - 22 November 2024

Barcelona, Spain



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Spectroscopic and Metabolic Manifestations of Brain Abnormalities in “Long COVID” Patients With Persistent Neurological Complications

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The majority of COVID-19 patients present with moderate and sometimes persistent neurological manifestations, including anosmia, ageusia, periorbital pain, vertigo, fatigue, headaches, disturbances of attention, concentration, language, memory and the neurovegetative system. However, little is known about the metabolic and spectroscopic abnormalities of their possible underlying brain lesions.

We collected magnetic resonance spectroscopy (MRS) and magnetic resonance imaging (MRI) data from 22 patients with COVID-19 and compared them with healthy subjects. Single-voxel MRS measurements were systematically performed at three brain locations: the medial frontal cortex, the hippocampus and the protuberance. The results of this work demonstrate the potential of MRS to reveal spectroscopic and metabolic brain abnormalities in COVID-19 patients with persistent neurological complications. Compared with MRI, MRS showed greater sensitivity in detecting and defining the extent of COVID-19 brain lesions.

Compared with healthy subjects, COVID-19 patients showed abnormalities depending on brain location. These abnormalities appear to reflect several pathophysiological processes of COVID-19,

which include, but are may be not limited to (1) an inflammatory reaction, (2) a glial reaction, (3) excitotoxicity and sometimes (4) neuronal dysfunction.

These findings could contribute to understanding the complex underlying pathophysiology of brain abnormalities in COVID-19 patients with persistent neurological symptoms.



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Exploring the Neurobiological Underpinnings of Long COVID-Related Cognitive Impairment - NeuroCOVID study

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Introduction: Neurological symptoms in Long-COVID (LC) are one of the most frequent (>65%) and disabling, yet their underlying mechanisms remain poorly understood. To test the hypotheses that SARS-CoV-2 can trigger Alzheimer's disease (AD) pathophysiology, we assessed plasma biomarkers of AD and neurodegeneration in individuals with LC and cognitive alterations.

Methods: Ninety-seven individuals diagnosed with LC and reporting cognitive complaints underwent a battery of neuropsychological tests evaluating 6 cognitive domains. Of those, 66 (68%) individuals had ≥ 1 altered domain, and we selected 31 individuals with sample available (LC with cognitive impairment, LC-CI). We matched by sex, age and COVID-19 severity these individuals with 31 COVID-19 survivors without persistent symptoms (recovered) and 31 uninfected individuals. Plasma levels of amyloid beta Ab42 and Ab40, phosphorylated tau (p-tau181), NfL [non-specific marker of axonal degeneration], and GFAP [astroglia reactivity] were measured by Simoa. Kruskal-Wallis (K-W) tests with Dunn's test for pairwise differences were used for comparisons.

Results: LC-CI participants were predominantly females (68%) with a median age of 46 [38-54] years and a median of 13 [8-18] symptoms. During acute SARS-CoV-2 infection, 45% needed hospitalization (only 16% required high-flow oxygen). Samples were collected 1 [0.9-1.5] years after symptom onset. Cognitive evaluation revealed that 48% had ≥ 2 cognitive domains impaired, mainly in processing speed (48%), attention (42%), perceptual-motor skills (32%), executive function (29%) and verbal fluency (29%). Plasma levels of Ab42 and Ab40 were significantly decreased in the LC-CI group compared to uninfected and recovered individuals (K-W $p < 0.001$ for both markers, and Dunn's comparisons $p < 0.01$ for all cases). The Ab42/Ab40 ratio was also decreased in LC-CI compared to uninfected controls (K-W $P = 0.01$, Dunn's test $p = 0.01$). These changes were independent of acute COVID-19 severity. In contrast, no differences were observed in the levels of p-tau181, GFAP and NfL between groups.

Conclusions: Lower plasma levels of Ab42 and Ab40, along with decreased Ab42/Ab40 ratio indicate that SARS-CoV-2 infection may have lasting biological effects on the brain associated with long-term cognitive impairment, even after mild COVID-19. Despite some similarities with AD-associated hallmarks, the lack of alteration in other biomarkers may indicate alternative mechanisms of neuronal dysfunction in LC.



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Impact of COVID-19 Vaccination on Quality of Life up to 2+ Years Post SARS-CoV-2 Infection: A Cohort Study in Israel, 2021-23

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Background: The long-term impact of COVID-19 vaccination on post-acute COVID-19 symptoms and associated quality of life (QoL) changes remains incompletely described. This study aimed to explore the impact of the timing of COVID-19 priming and booster doses, on reporting long COVID symptoms and associated QoL changes.

Methods: Individuals who had PCR testing for SARS-CoV-2 processed in a government hospital in Northern Israel between 15th March 2021 and 15th June 2022 were invited to answer serial online surveys collecting information on SARS-CoV-2 infection, vaccination status and post-acute symptoms every 3-4 months for two years. Participants were categorized into groups based on number of doses received prior to infection. We compared these groups over time in terms of reporting post-COVID symptom clusters and QoL, using population-average and mixed-effects regression models, respectively.

Results: Of the 4809 individuals who joined and answered up to 5 surveys, 1377(28.61%) and 3432 (71.39%) reported positive and negative SARS-CoV-2 tests respectively. After adjusting for confounders, having received at least 3 vaccine doses pre-infection, was associated with a 32% reduction in reporting at least one long COVID symptom cluster compared to those unvaccinated, (adjusted odds ratio [aOR] = 0.68, p= 0.035) and an associated increase in quality of life ($\beta = 0.07$, p = 0.005). The effect was constant over time, and vaccination after infection had no effect on long COVID reporting or quality of life.

Conclusion: COVID-19 vaccination with at least three doses pre-infection had a significant and ongoing protective effect against long COVID and its associated loss of QoL for at least two years. Longer term protection, the role of re-infection and the impact of ongoing viral mutations on the role of vaccination against long COVID remain to be clarified.



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Social and Emotional Characteristics of People Living With Long COVID in Catalonia, Spain

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Background: Long COVID can have a profound effect on both physical and emotional health. The uncertainty of recovery and the chronic nature of the condition can result in a decline in overall well-being.

Material and Methods: People with Long COVID visited at the Long COVID Unit of Hospital Germans Trias i Pujol of Badalona between June 2020 and December 2022 filled out a questionnaire in their first medical visit including socio-demographic data, perceptions about disease, HADS questionnaire, Perceived Stress Scale and Davidson Trauma Scale (only people who had been in ICU).

Results: 445 participants were included (women 71%; men 29%). Mean age was 49.9 (SD: 12.2). Eighty-four percent lived with a partner and/or family, 47% had a university degree or similar, 43% were on sick leave, whereas 35% were actively working. Twenty-three percent were health care professionals. Ten percent had been admitted to an ICU. Participants answered yes to the following statements: "After COVID my psychological health is worse" (76%); "Most of my family understands what is happening to me" (77%); "I feel understood by health care professionals" (74%); "I feel capable to go back to my previous life" (35%); "I have all the support required to face this situation" (86%); "I am worried about not recovering totally" (89%); "Now I have more difficulties to interact with other people" (52%). We observed moderate or severe anxiety and depressive symptoms in 36% and 26%, respectively. Mean perceived stress (cut-off for

moderate stress= 14) was 20 (SD: 8) and mean trauma (cut-off for moderate trauma= 40) was 43 (SD: 31).

Conclusions: Middle age women living with a partner and/or family and on sick leave formed a large part of the participants evaluated. Anxiety and depressive symptoms were frequent, and stress and trauma moderate. A significant number of participants spoke of impairment of their psychological health after COVID, inability to go back to previous life, worry about not recovering totally and social difficulties. Identifying social and emotional characteristics of people with Long COVID is crucial to develop interventions to improve their physical and mental health care.



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Evolution of Neuropsychological Symptoms and Disability in a Cohort of Individuals With Long COVID and Cognitive Complaints: The KING-COG Study

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Introduction: Follow-up studies in people with Long COVID (PWLC) using self-reported questionnaires indicate that cognitive and fatigue symptoms persist at least 1 year after COVID-19 infection. Neuropsychological follow-up with a comprehensive evaluation can help to understand the evolution of symptoms and disability in PWLC.

Methods: PWLC from 2-year prospective cohort study (HUGTIP/PI-20-217) attended at Germans Trias i Pujol Hospital, who reported cognitive symptoms and had at least 2 neuropsychological comprehensive assessments, were included. Those patients considered candidates were offered to participate in a cognitive training program (Guttman NeuroPersonal Trainer©). We defined cognitive impairment (CI) as performing ≥ 1.5 SD below the mean. Data on daily living activities, memory failures, disability, sleep quality, depression and anxiety were also collected.

Results: Sixty participants (78% women) with a mean age of 49 (SD:10) years and 13 (SD:4) years of education were included. Median time from COVID-19 infection to baseline assessment was 12 months (IQR:10-17), and, at the end of follow-up, 21 months (IQR:19-26). Seventy-two percent of participants showed CI in ≥ 1 test at baseline. At the end of follow-up, this percentage decreased to 62% without reaching statistical significance

($p=0.210$). However, significant improvements were found in attention/working memory ($p=0.032$), processing speed ($p=0.006$), verbal fluency ($p\leq 0.001$), and executive functions ($p=0.015$). Global cognitive functioning also showed significant improvement ($p=0.002$). No other relevant changes were found ($p>0.05$). Fifty-five percent of participants underwent the CT program; seventy-six percent showing good adherence ($\geq 70\%$). When we assessed whether the evolution of symptoms differed between the group that completed the CT program and the group that did not, we did not observe any significant differences ($p>0.05$).

Conclusions: We observed significant improvements in cognitive scores, yet a considerable proportion of the sample still exhibited cognitive impairment. No differences in disability, daily functioning, depressive or anxiety symptoms, sleep quality were found between timepoint assessments. Participation in the CT program did not result in any significant differences in the evolution of neuropsychological symptoms or disability. Specific programs for PWLC that combine CT with other techniques like psychoeducation, compensatory strategies, and pacing need to be evaluated to determine their effectiveness in reducing cognitive symptoms and disability.



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Attenuated Inflammation in Seronegative Long COVID Patients

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Background: The role of the adaptive immune response in long COVID remains debated. Contrasting hypotheses point to either an excessive immune response associated with inflammatory damage or an insufficient immune response that may enable viral persistence. To address this issue, we evaluated the concentrations of inflammatory biomarkers in patients with long COVID presenting either with a positive (LC+) or a negative (LC-) anti-SARS-CoV-2 serology.

Methods: The study included seropositive (LC+, n=24) and seronegative (LC-, n=24) long Covid patients, individuals who recovered from acute COVID without sequelae (RE, n=26), and uninfected healthy blood donors (HD, n=10). Sera were screened for 102 inflammatory and vascular biomarkers using the Olink Target 96 Inflammation panel and multiplexed immunoassays.

Results: Although the spectrum of persistent symptoms was similar in the two long COVID groups, clear differences were observed between these groups. Analysis of antibodies to different SARS-CoV-2 viral proteins confirmed the very low antiviral response in the LC- group. The pro-inflammatory cytokines IL-6, MCP-3, and IL-1 β were decreased in the LC- group compared to the LC+ group, while IL-8, MCP-3, and IL-1 β were decreased in the LC- compared to the RE group. Importantly, IL-8 and IL-1 β were also significantly

decreased in LC- patients compared to healthy donors, pointing to a persistent anti-inflammatory state in seronegative long COVID patients. In contrast, markers of vascular damage (VEGF-A, Angiopoietin-1) did not differ between groups. Correlation analyses showed overall strong associations between the different mediators decreased in the LC- group (IL-8 vs IL-1 β : R=0.94, P<0.0001), pointing to coordinated changes affecting the overall inflammatory state in seronegative long COVID patients.

Conclusions: LC+ and LC- patients differed not only in their humoral response but also in their inflammatory status. In this analysis, we did not detect strong biomarker differences between seropositive long COVID patients and recovered individuals. In contrast, seronegative long COVID patients showed unexpectedly low inflammation, suggesting that not only the adaptive but also the innate antiviral response may be impaired in this group. The divergent findings observed in two groups of long COVID patients sharing a comparable spectrum of symptoms raise the possibility of distinct pathogenic mechanisms in long COVID.



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Values and Preferences in COVID-19 Public Health Guidelines: A Systematic Review

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Background: Internationally accepted standards for trustworthy guidelines include the necessity to ground recommendations in values and preferences. Considering values and preferences respects the rights of citizens to participate in health decision-making and ensures that guidelines align with the needs and priorities of the communities they are intended to serve. Early anecdotal reports suggest that COVID-19 public health guidelines did not consider values and preferences.

Material and Methods: We performed a systematic review of COVID-19 public health guidelines. We searched the eCOVID-19 RecMap platform—a comprehensive international catalog of COVID-19 guidelines—up to July 2023 and the Guidelines International Network (GIN) Library—an international library of guidelines published or endorsed by GIN member organizations—up to May 2024. We included guidelines that made recommendations addressing vaccination, masking, isolation, lockdowns, travel restrictions, contact tracing, infection surveillance, and school closures. Reviewers worked independently and in duplicate to review guidelines for consideration of values and preferences. We used descriptive statistics to summarize guideline characteristics, methods, and consideration of values & preferences.

Results: Our search yielded 130 eligible guidelines, of which 41 (31.5%) were published by national organizations, 70 (53.8%) by international organizations, and 19 (14.6%) by professional societies and associations. Twenty-eight (21.5%) guidelines considered values and preferences. Among guidelines that considered values and preferences, most did so to assess the acceptability of recommendations (23; 82.1%) and

by referencing published research (25; 89.3%). Guidelines only occasionally engaged laypersons as part of the guideline development group (8; 28.6%). None of the guidelines performed systematic reviews of the literature addressing values and preferences.

Conclusion: Most COVID-19 public health guidelines did not consider values and preferences. When they were considered, it was often suboptimal. Disregard for values and preferences might have partly contributed to divisive and unpopular COVID-19 policies. Given the possibility of future health emergencies, we recommend guideline developers identify efficient and effective methods for considering values and preferences in crisis situations.



19

Improvement of Severe Digestive Symptoms With Maraviroc in Long COVID Patients: A Case Series

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Introduction: Digestive symptoms are frequent in long COVID (LC) patients and may be related to mucosal inflammation, histamine intolerance and/or the persistence of viruses in the digestive reservoirs. A recent report described that targeting CCR5 and fractalkine receptors using maraviroc, a CCR5 antagonist, and pravastatin, an HMG CoA reductase inhibitor, respectively, leads to decrease several cytokines and chemokines level. After a spectacular improvement of digestive disorders in one LC patient, we tested the efficacy of maraviroc combined with pravastatin, in eight patients with similar symptoms.

Methods: Patients with LC diagnosed according to WHO definition and with severe digestive symptoms received maraviroc (150 mg BID for 7 cases and 300 mg BID for 1) in combination with pravastatin (10 mg DQ) for at least 12 weeks. Digestive symptoms (Likert score questionnaire) and other symptoms including fatigue, pain, etc, were collected at D0, D15, D28, then monthly. Fecal calprotectin, cytokines and blood serotonin levels were measured. Median follow-up was 2.5 months (1-18 months)

Results: 8 patients (7 female, 1 male), mean age: 25 (range: 15-47) were included. Mean duration between acute COVID and maraviroc initiation was 38 months (range 22-50). All had received previously anti-histamine drugs with partial/no effect. A beneficial effect of maraviroc/pravastatin on digestive symptoms was reported by 8/8 cases after a mean exposure of 9.56 days (range: 91-30). At D15, the most alleviated symptoms included diarrhea (n=6/7), spraints (n= 5/5), appetite loss (n=4/6), bloating (n=7/8), abdominal cramps (n=7/8), nausea (n=6/8). Vomiting (3/3) and rectorragia (1/1) disappeared. A beneficial effect

was also observed on fatigue (n=4/8), brain fog, (n=3/8), weight (n=2/8). No improvement was observed on neuropathic pains nor sleep disorders.

This effect was sustained in 7/8 patients at M1 and in 6/6 at M3. One patient relapsed when treatment was stopped and had to take it again. Adverse events were assessed as mild and transient. Calprotectin, cytokines and serotonin dosages are ongoing.

Conclusion: From this pilot study, we conclude that maraviroc combined with pravastatin, seems to decrease severe digestive disorders of patients with LC, and that this effect, even if not curative, justifies a double blinded randomized controlled trials.



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Interventions for the Management of Long COVID (Post COVID Condition): A Living Systematic Review

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Background: We present the first iteration of a living systematic review comparing the effectiveness of interventions for the management of long COVID.

Materials and Methods: We searched research databases, from inception to December 2023, for trials that randomized adults with long COVID to pharmacologic or non-pharmacologic interventions, placebo/sham, or usual care. Reviewers worked independently and in duplicate to screen search records, extract data from eligible trials, and assess risk of bias. The diversity in interventions and outcomes precluded meta-analyses. We assessed the certainty of evidence using the GRADE approach.

Results: We identified 24 eligible trials with 3,695 patients. Four trials (708 patients) investigated pharmacologic interventions, eight (985 patients) physical activity or rehabilitation, three (314 patients) behavioral, four (794 patients) dietary, four (309 patients) medical devices and technologies, and one (585 patients) a combination of physical exercise and mental rehabilitation.

Moderate certainty evidence suggests that, compared to usual care, an online program of cognitive behavioral therapy (CBT) probably reduces fatigue (MD: -8.4; 95% CI: -13.11 to -3.69; Checklist Individual Strength (CIS) fatigue subscale; higher scores indicate greater impairment) and probably improves concentration (MD: -5.2; 95%

CI: -7.92 to -2.43; higher scores indicate greater impairment).

Moderate certainty evidence suggests that, compared to usual care, an online, supervised, combined physical and mental rehabilitation program probably leads to improvement in overall health, with an estimated 292 more patients per 1,000 experiencing meaningful improvement or recovery (95% CI: 61 more to 310 more), probably reduces symptoms of depression (MD: -1.5; 95% CI: -2.41 to -0.51; Hospital Anxiety and Depression Scale depression subscale; higher scores indicate greater impairment), and probably improves quality of life (MD: 0.04; 95% CI: 0 to 0.08; PROMIS 29+1 Profile; higher scores indicate less impairment).

We did not find compelling evidence supporting the effectiveness of other interventions, including vortioxetine, leronlimab, a combination of probiotics and prebiotics, coenzyme Q10, amygdala and insula retraining, L-arginine and vitamin C, inspiratory muscle training, transcranial direct current stimulation, hyperbaric oxygen, a mobile application providing education on long COVID, among others.

Conclusion: Moderate certainty evidence suggests that CBT and physical and mental rehabilitation probably reduce long COVID symptoms.



21

Evaluate Post-COVID Conditions Case Definitions for Longitudinal Community-Based Cohort Using Self-Reported Data on Symptomatology and Disabilities

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Background: We examined the prevalence, overlap, and risk factors of various Post-COVID Conditions (PCC) definitions by integrating patient-reported data on post-COVID symptoms and disability status from a community-based cohort.

Method: Data were drawn from the CHASING COVID Cohort, surveying U.S. adults approximately every 3 months between 2020/03 and 2023/12. The analysis included SARS-CoV-2 infections identified by self-reported positive PCR or antigen tests between 2020/12 and 2022/12. Objective symptom persistence was defined as reporting the presence of any of seven common PCC symptoms that were absent pre-infection. Subjective symptom persistence was determined by answering "yes" to "Are you still experiencing symptoms more than 4 weeks after COVID-19 that are not explained by another cause?". PCC Definition1 was defined as objective symptom persistence at one timepoint 3-12 months post-infection. Built on Definition1, Definition1.A added a second objective symptom persistence timepoint ≥ 60 days from the initial symptomatic timepoint, Definition1.B combined Definition1 with reporting subjective symptom persistence, and Definition1.C combined Definition1 with the presence of disabilities according to The Behavioral Risk Factor Surveillance System tool. To further refine specificity, Definition1.A.C and 1.B.C combined Definition1.A and 1.B with the presence of disabilities. Definitions 2 and 3 included participants who either self-identified or were told by a doctor they might have Long COVID within 12 months of infection, regardless of symptoms or disabilities reported. Prevalence, overlaps, and

associations with demographic factors, comorbidities, vaccination status, and prior infections were analyzed for each definition.

Results: There were 1,977 person-infections, with 78% aged 18-49, 50% female, 59% White Non-Hispanic, and 38% having a college degree or higher. Definition1 showed the highest prevalence (44.2%) and Definitions 1.B and 1.B.C showed the lowest (11.6% and 8.9%). Definitions 1.A and 1.C had high agreement (prevalence:32.2% and 28.6%; Cohen's kappa-coefficient:0.62; 95%CI:0.58-0.65) and Definitions 2 and 3 had high agreement (prevalence:26.5% and 18.7%; Cohen's kappa-coefficient:0.55;95%CI:0.51-0.60). Lacking a college degree, having ≥ 2 comorbidities (vs. no comorbidity), smoking, and having prior SARS-CoV-2 infections were consistently associated with a higher risk of PCC across all definitions after adjusting for age and gender.

Conclusions: This study highlights significant variability in PCC prevalence depending on the case definition used.



22

Non-White Ethnicity is a Risk Factor for Long Covid: A Cohort Study of Referrals to Walsall Long Covid Service

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Background: Walsall, UK, has an ethnically diverse population, with a total population of approximately 284 000. We conducted a prospective cohort study of patients referred to Walsall Long Covid Service to investigate whether non-white ethnicity was a risk factor for long covid.

Materials and Methods: Demographic data, including self-reported ethnicity data, was collected from all patients referred to Walsall Long Covid Service (WLCS) between 1st October 2023 and 31st March 2024 with a clinically confirmed diagnosis of long covid (Centre for Disease Control and Prevention diagnostic criteria). Using 2021 UK Census Data (UK Office for National Statistics) the population of Walsall was determined and classified by self-reported ethnicity. From this population data, expected numbers of referrals to WLCS by ethnic group were determined. This data was compared with the self-reported ethnicity data from the WLCS patient cohort, with any differences examined for statistical significance using Analyse-it statistical software (Mann-Whitney U test)

Results: The 2021 Census records a Walsall total population of 284 117: White 207687 (71.3%), South Asian 53194 (18.7%), Black 13030 (4.6%), Mixed race 9332 (3.3%) with 5874 (2.1%) identified as other non-White /White British ethnicity.

From 1st October 2023 and 1st March 2024, 287 patients were referred to WLCS. Complete ethnicity data was recorded from 257 patients: White 14 (54.9%), South Asian 81 (31.5%), Black 19 (7.4%) Mixed race 9 (3.5%), other 7 (2.7%)

The percentage and number of South Asian patients in the WLCS cohort was significantly greater than in the total population (31.5% v

18.7%, 81 patients v 48 expected patients, $p < 0.01$). A statistically significant greater percentage and number of Black patients was also recorded in the WLCS cohort compared to the total population (7.4 v 4.6%, 19 patients v 12 expected patients, $p < 0.01$)

The percentage/number of patients referred to WLCS of non-white ethnicity was significantly greater than in the total population (45.1 v 28.7 %, 116 v 73 $p < 0.01$)

Conclusion: Non-white ethnicity is a risk factor for long covid. Our study has confirmed that this increased risk is found in patients of South Asian and Black ethnicity.



23

Long COVID Prevalence Among Healthcare Workers From Five Spanish Hospitals

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Background: Healthcare workers were on the frontline during the pandemic, and as such, more exposed to COVID-19 in their workplace. This may mean that they are more affected with long COVID, which can have several impacts in their job performance.

Aims: The aim of this study is to investigate the prevalence of long COVID among healthcare workers across five Spanish hospitals.

Methods: A descriptive study was carried out in five Spanish hospitals from Madrid (n=1), Alicante (n=1) and Barcelona (n=3). Two sources of data were used: hospital registries of COVID-19 and long COVID cases in 3 hospitals, and surveys sent out to hospital staff in 2 hospitals. Common variables across databases were sex, age and occupational group. Analysis focused on describing long COVID prevalence by gender, age, occupational group and other job factors.

Results: The prevalence of long COVID among HCWs ranged from 3% (CI 2.43-3.59) to 5% (CI 4.27-5.67). Prevalences were significantly higher in women in four hospitals, the highest being 5.9%

(CI 4.47-7.32); HCW over 50 years of age with the highest at 15% (CI 4.6-24.57); nurse assistant, administrative staff and other hospital workers. Contract type, job type, shift work and number of COVID-19 episodes were not associated with the prevalence of long COVID.

Conclusions: Long COVID in HCW shows a real occupational health problem in Spanish hospitals, with prevalence around 5%, particularly among females, older age groups and specific occupational categories. These findings suggest the need for targeted interventions and policies to manage affected HCWs.



24

Impact of Reinfections in Long COVID Patients

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Background: Few studies have analyzed the risk of SARS-CoV-2 reinfections in Long COVID (LC) patients. Questions about whether reinfections increase the risk of worsening Long COVID symptoms and add associated health risks have broad public health implications.

Materials and Methods: To evaluate the impact of new SARS-CoV-2 infections on LC symptoms in patients diagnosed with LC, we performed a retrospective review of the medical records of patients included in a prospective cohort of LC patients (May 2020 - May 2024) with a minimum of two years of follow-up in the LC Unit at Hospital Germans Trias i Pujol. Reinfection was defined as a positive SARS-CoV-2 test (polymerase chain reaction (PCR) or Nasopharyngeal Lateral Flow Assay rapid antigen test (RAT)) 90 days or more after the first infection.

Results: Clinical data on reinfection were available for 261 (41.2%) of the 633 patients included in the LC cohort. Among these, 212 (81.2%) were female, with a median age of 47 years (IQR: 41-55), and a median number of symptoms prior to reinfection of 10 (IQR: 7-14). Reinfection was diagnosed in 81 cases (31%) through a positive SARS-CoV-2 PCR and in 180 cases (69%) using a RAT. Most patients (222, 85.1%) were reinfected during the period dominated by the Omicron variant, and only 19 (7.28%) hadn't been vaccinated prior to reinfection. Following reinfection, 148 patients

(56.7%) experienced a worsening of LC symptoms: 54 (20.7%) had worsening of previous symptoms, 29 (11.1%) developed new symptoms, 56 (21%) experienced both worsening of previous symptoms and the onset of new ones, while 9 (3.4%) had insufficient data in their medical records to determine symptom changes.

Conclusions: SARS-CoV-2 reinfections are associated with worsening symptoms or the development of new ones in a large fraction of subjects with Long COVID. Preventive strategies, such as vaccination, should be prioritized to reduce the risk of reinfections. Additionally, clinical trials are needed to evaluate the impact of early antiviral treatments for acute SARS-CoV-2 infections on preventing Long COVID worsening.



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Obesity is a Risk Factor for Long Covid but only in the Presence of Other Indices of Social Deprivation

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Background: Walsall has one of the highest prevalences of obesity in the UK. 2 of its 6 Urban Areas are amongst the most social deprived in the UK, whilst others have little social deprivation (measured by Index of Multiple Deprivation (IMD) score). We investigated whether obesity was an associated risk factor for long covid and whether this was affected by other indices of social deprivation.

Material and Methods: Body Mass Index (BMI) and residential demographics were recorded for all patients referred to Walsall Long Covid Service (WLCS) 1st October 2023 to 31st March 2024 with a clinically confirmed diagnosis of long covid. Patients were classified against World Health Organisation Classification of Obesity. IMD was determined for each Urban Area using Walsall Public Health data. Using residential demographics, the Urban Area/IMD for each patient was determined.

The prevalence of obesity in Walsall was obtained using Public Health Walsall data. The obesity prevalence of the WLCS cohort was determined and compared to total Walsall population. This data was also examined following Urban Area/IMD score sub-classification. Statistical significance of results was examined using Analyse-it statistical software (Mann Whitney U test)

Results: 287 patients were referred to WLCS with a clinically confirmed diagnosis of long covid 1st October 2023-31st March 2024. Complete data was found on 257 patients. 190 patients (73.9%) were classified obese (WHO classes 1-3) compared to a Walsall population obesity prevalence of 62.0% (p<0.01).

117 patients (45.5%) were classified with morbid obesity (WHO classes 2-3) compared with a Walsall

population prevalence for morbid obesity of 26.1% (p<0.01)

When prevalences of obesity and morbid obesity for both WLCS cohort and total population were examined by Urban Area IMD, the prevalence of obesity and morbid obesity was statistically significantly greater in the 2 areas of greatest social deprivation (IMD 1.48 and 1.81) Obesity: 80.3% v 62.0%, 81.8% v 62.0% (p<0.01); morbid obesity: 51.9% v 26.1%, 53.1% v 26.1% (p<0.01). This statistically significant difference was not found for the other Urban Areas/IMD scores

Conclusion: Obesity is an associated risk factor for long covid, but only in the presence of other indices of deprivation.



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Long COVID Immune and Metabolic Imbalance: Findings from Comprehensive Standardized Clinical Testing

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Long COVID (LC) is a multi-systemic condition affecting approximately 10% of people infected with SARS-CoV-2. The underlying mechanisms of persistent symptomatology remain poorly understood, and it may be linked to a dysregulation of the immune system, including autoimmune responses.

We included 633 participants with LC and 229 COVID-19 survivors without persistent symptoms (R) from the KING cohort (HUGTIP). To exclude other pathologies, we conducted a standardized clinical test battery during the 2-year follow-up, including a complete blood count, metabolic panel, electrolyte measurements, and autoimmune diseases panels. We conducted a cross-sectional analysis using clinical tests within 6-18 months post-symptom initiation. Mann-Whitney tests were performed to compare groups for each clinical test, and p-value correction was applied (FDR), considering p-adjusted <0.05 as significant. Additionally, we performed a longitudinal analysis to examine the evolution of relevant autoantibodies (antinuclear [ANAs], rheumatoid factors, anti-parietal cells, anti-mitochondrial, anti-smooth muscle, and anti-liver/kidney microsomal).

The median age of participants were 51 [43-58] and 57 [44-64] years in LC and R, respectively. The LC group had a higher proportion of female

participants (71.7%) compared to R group (45.5%). Blood cells analysis revealed that LC participants had increased levels of leukocytes, CD4 T-cells (%), CD4/CD8 ratio, neutrophils, and platelets, while decreased levels of monocytes (%), immature granulocytes (%), erythrocytes and red blood cell distribution width (RDW). Metabolic tests indicated that LC participants had higher levels of cholesterol (total, LDL, HDL), and lower levels of urea, creatinine and creatinine kinase compared to R participants. Despite complement system components C3 and C4 were elevated in LC participants, no differences were observed in the proportion of individuals with detectable autoantibodies. In the longitudinal analysis, the proportion of individuals with ≥ 1 positive result for ANAs was higher in the LC group (47%) compared to the R Group (35%, $p=0.004$). Interestingly, after excluding participants with a previous diagnosis of autoimmune disease, the proportions remained similar (LC=46%;R=38%, $p=0.126$).

We did not observe any alterations in commonly analyzed autoantibodies. However, we detected elevated levels of C3 and C4 complement components, along with changes in cholesterol levels and immune cell profiles, suggesting an underlying inflammatory and metabolic dysregulation.



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A Machine Learning Tool to Operationalize Intrinsic Capacity in Predicting Recovery From Post-acute Sequelae COVID-19

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Background: Intrinsic Capacity (IC) depict a comprehensive health measure in older people. This study aims to define an intrinsic capacity index (ICI) for people with PASC starting from validated questionnaires (DASS, EQ-5D-5L, ISI, CD-RISC, and SF-36) that describe the IC 5 health domains including locomotion, sensory, vitality, cognitive and psychosocial. The secondary objective is to demonstrate that our ICI has good sensitivity and, thus, clinical utility to predict PASC recovery within 2-years after infection.

Methods: We leveraged a majority ranking (MR) algorithm to order patients according to their health scores.

Here, we adapt this method to grade patients across the 5 health domains and understand how each patient ranks across the entire spectrum of their health, ensuring a holistic view of each patient's condition.

We then constructed a synthetic ICI, via a symbolic regression machine learning algorithm to find an aggregation function satisfying patients' ranking and being able to predict PASC recovery defined as a medical judgment based on a composite of symptoms improvement/resolution. The univariate analysis helps in assessing whether ICI alone is a strong predictor of recovery. The multivariate approach compares the predictive power of ICI against established metrics, controls for confounding factors, and assesses whether IC adds unique value in describing PASC recovery.

Results: A total of 660 people were included, mean age was 65 years, 43.8% were women, 14% were fit, 60% pre-frail, and 26% frail.

11 out of the chosen 19 variables were relevant to the formulation of the ICI shown in Figure 1 panel A.

The univariate logistic model showed that ICI was a significant predictor of PASC recovery (OR [5%-95%]=1.46 [1.27-1.68], p-value<0.001) with good predictive power (F1 score = 73.6%). The IC index being the only significant predictor in the multivariate analysis suggests it may uniquely capture critical aspects of recovery not fully represented by the other measures.

Conclusions: We successfully described PASC by means of the IC construct in the framework of healthy aging. Upon providing a rigorous framework to define IC, we also developed a formula (ICI) to be used in clinical and research settings to predict PASC recovery.



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A Double-Blind, Randomized Study to Evaluate the Efficacy and Safety of Bezisterim (NE3107) in Adults With Long COVID

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Background: Strong emerging evidence suggests that 2 of the most common symptoms of Long COVID—cognitive impairment and fatigue—may reflect a chronic inflammatory state due to a persistent viral reservoir, activation of latent viruses, or persistence of macrophage inflammatory memory. In particular, the toll-like receptor (TLR) signaling pathway may play an important role in Long COVID. Bezisterim (NE3107) is an oral, blood-brain barrier-permeable, anti-inflammatory, insulin-sensitizing agent that inhibits TLR-driven phosphorylation of extracellular signal-regulated kinase (ERK). Bezisterim also inhibits inflammatory nuclear factor kappa B (NF-κB) and tumor necrosis factor alpha (TNF-α) signaling. Additionally, bezisterim is not immunosuppressive and has a low predicted risk for interactions with antivirals.

Materials and Methods: This is a phase 2, double-blind, randomized, placebo-controlled, 16-week study in 208 adults 18 to 64 years of age with a diagnosis of Long COVID per the World Health Organization definition with symptom duration of at least 3 months and not longer than 36 months from the index COVID-19 infection. Participants, enriched for an inflammatory phenotype with cognitive impairment and fatigue, will be randomized 1:1 to either 20-mg bezisterim or matching placebo twice daily for 3 months. The design and plan of conduct incorporated advice from both clinician expert and patient advisory boards.

Efficacy assessments include the CogState Cognitive Battery of Tests, Patient-Reported

Outcomes Measurement Information System (PROMIS) Cognitive Function Short Form 8a, PROMIS Fatigue Short Form 13a, PROMIS Sleep Disturbance Short Form 8a, DePaul Symptom Questionnaire-Post-Exertional Malaise, and 12-Item Short Form Health Survey.

Other endpoints include Clinician Global Impression of Severity and Change, Patient Global Impression of Severity and Change (overall, fatigue, thinking clearly), Long COVID Other Burdensome Symptoms questionnaire (headache, tinnitus, decreased appetite), and safety and tolerability. Exploratory endpoints include change in biomarkers of inflammation, immunity, neurodegeneration, and metabolic dysfunction as well as change in biological age as measured by DNA methylation.

Results: We will present the study rationale and design at the conference.

Conclusions: This phase 2 study is expected to provide important data on the effects of bezisterim, which targets several biological pathways of interest in Long COVID.



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Impact of Pre-existing Conditions on Long COVID Symptoms: Cognitive Impairment, Fatigue, and Beyond

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Background: Long COVID is associated with a wide array of persistent symptoms, including fatigue, cognitive impairment, and other lingering effects. Pre-existing comorbidities are thought to exacerbate these symptoms. This study explores the impact of common pre-existing conditions, such as hypertension, asthma, and diabetes, on the severity and duration of Long COVID symptoms, including cognitive impairment and fatigue.

Materials and Methods: A cross-sectional analysis was conducted on 170 patients from the ARALONGCOV study. Pre-existing conditions were analyzed in relation to cognitive impairment and fatigue duration, with bivariate t-tests and multivariate linear regression models employed to assess their relationships. Chronic inflammation and oxygen flow issues associated with asthma were hypothesized as potential mechanisms behind cognitive impairment.

Results: Multivariate regression analysis revealed that pre-existing asthma was significantly associated with an increased risk of post-COVID cognitive impairment ($p = 0.044$, coefficient = 0.0576). This could be explained by chronic inflammation, which is characteristic of asthma, potentially compounding the inflammation from COVID-19 and contributing to cognitive decline. Additionally, asthma's impact on oxygen flow may exacerbate cognitive issues. Neither pre-existing hypertension ($p = 0.685$) nor diabetes ($p = 0.872$) were significantly linked to cognitive impairment. Furthermore, no significant associations were found between pre-existing conditions and fatigue duration ($p > 0.3$ for all conditions). The fatigue model explained only 0.9% of the variability in symptom duration.

Conclusions: Pre-existing asthma appears to be a notable predictor of post-COVID cognitive impairment, likely due to chronic inflammation and reduced oxygenation. In contrast, other common pre-existing conditions like hypertension and diabetes do not significantly influence cognitive or fatigue outcomes in Long COVID patients. These findings highlight the need for further research into the biological mechanisms driving cognitive impairment in asthmatic patients with Long COVID, as well as the exploration of additional symptoms to capture the full impact of pre-existing conditions on recovery.



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Inflammatory Markers, Bacterial Composition and Short Fatty Acids in the Oral Microbiota from Patients with Persistent COVID-19

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Background: The ongoing COVID-19 pandemic continues to have a significant negative impact on global public health. While most efforts have focused on combating the infection in its acute phase, a large number of people experience persistent symptoms after infection, known as long COVID (LC). Although the causes of LC are not yet fully understood, some studies have suggested the possible involvement of the gut microbiota. However, knowledge about the role of the oral cavity microbiota in people with LC is limited.

Objective: This study aims to determine whether there are significant differences in the composition of the oral microbiota, salivary cytokine levels, and microbial metabolites such as short-chain fatty acids (SCFAs) between patients with LC and healthy subjects.

Methods: A case-control study matched by age and sex compared the oral microbiota and levels of the pro-inflammatory cytokines interleukin-6 and tumor necrosis factor in saliva between patients with LC and healthy individuals. Oral microbiota samples were amplified using the hypervariable V3-V4 regions of the 16S rDNA subunit and sequenced on an Illumina Miseq sequencer using the paired-end protocol (2x300 base pairs). Sequences were processed with QIIME 2 software using DADA2. Alpha and beta diversity analyses were conducted. SCFAs were quantified using LC-MS/MS

Results: Analysis of 16S rDNA showed no significant differences in bacterial diversity between the groups. Similarly, levels of interleukin-6 and tumor necrosis factor did not vary. However, valeric acids levels were significantly elevated in LC patients.

Conclusions: There were no significant differences in the composition of the oral microbiota or the analyzed cytokines. This suggest potential normalization of microbiota and absence of associated inflammatory response in both groups. Further studies are required to understand the implications of the elevated valeric acids levels in LC patients.



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Can Fasting and Caloric Restriction Aid in Managing Long COVID? A Systematic Review of Interventions and Outcomes

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Background: Long COVID Syndrome (LCS) has emerged as a significant health concern, characterized by persistent symptoms that extend beyond the acute phase of COVID-19 infection. Fasting and caloric restriction, known for their roles in chronic disease management, may offer potential therapeutic benefits for LCS. We aimed to evaluate the current evidence on the use of these dietary interventions in managing LCS.

Material and Methods: A thorough analysis was conducted using Arksey and O'Malley's framework and the PRISMA-ScR guidelines. We systematically searched peer-reviewed articles and gray literature across multiple databases, focusing on studies published between 2019 and 2024. The review included interventions involving fasting and caloric restriction, evaluating their effects on LCS symptoms.

Results: From 896 records, 11 studies met the inclusion criteria, comprising case series, narrative reviews, and trial protocols. The interventions ranged from medically supervised fasting to intermittent fasting and caloric restriction strategies. Reported outcomes included improvements in symptom severity, quality of life, and reductions in biological markers as inflammation. Despite these promising findings, the evidence remains preliminary, with considerable variability in study designs and intervention protocols.

Conclusion: This review suggests that fasting and caloric restriction hold potential as therapeutic strategies for managing LCS. However, the current evidence is inconsistent and reflects the early stage of research in this field. Further research with standardized methodologies and rigorous clinical trials is essential to confirm the efficacy and safety of these interventions for Long COVID.



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Invisible Disease, Multidisciplinary Answer: The Need for a Belgian Long COVID Research Network

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The current Long Covid epidemic highlights the inadequacy of both medical and societal structures in addressing biopsychosocial issues. This new illness presents an unprecedented scientific challenge, remaining largely invisible to conventional clinical technoscience. The SARS-CoV-2 virus affects the entire human body, compromising its integrity and making it socially invisible.

There is a communication breakdown between Long Covid patients, who feel abandoned, and physicians, who seem unaware of the gravity of the situation. Policymakers, at least in our country, lack awareness of the scale of this phenomenon. Acknowledging these challenges and in partnership with patients in primary care, we began by observing, listening to, and understanding patients, while studying their cases in light of the existing literature. Inspired by the Covid Human Genetic Effort initiative, a group of Belgian researchers started a Long Covid Research Network in collaboration with the Belgian Long Covid Patients Association. We aim to expand the network by bridging biomedical sciences and the humanities to grasp the full scope of this condition. Information sciences directly link primary care clinics and high-level research centers.

As a start, this Belgian Long Covid Research Network now encompasses more than 250 clinically identified patients (with a 2:1 female-to-male ratio, an average age of 42 years). These patients have undergone brain imaging (SPECT-

CT), multi-omic analysis, and neurobiological studies, as well as anthropological and clinical care approaches. We have successfully identified previously neglected patients, made the invisible visible, proposed Long Covid diagnostic biomarkers, and established therapeutic partnerships with patients from across Belgium. Our recent publications have documented the need for patient-centered research (Jamouille et al. Nature 2024, Menezes et al. Lancet Microbe 2024). Because of the clinical and biological similarities and the large societal need, we are also extending our research into other post-infectious illnesses such as ME/CFS.

We are actively seeking national and international collaborations (and urgently needed funding) in areas as diverse as immunology, virology, imaging, occupational medicine, health economics, and the epistemology and ethics of care.



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Long COVID in the South African Public Health Care Sector: A Scoping Review with a Focus on District Health Clinics and Diagnostic Challenges

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Background: Long COVID is a post-acute condition characterized by persistent symptoms following recovery from an initial COVID-19 infection. In South Africa's public health care system, especially in district health clinics, the management of Long COVID presents numerous challenges. These facilities are often under-resourced and overburdened, limiting their ability to diagnose and treat Long COVID effectively. This review explores the potential for misdiagnoses, underdiagnosis, and the systemic barriers within district health clinics that impact Long COVID care.

Materials and Methods: A scoping review was conducted using PRISMA-ScR guidelines to search academic databases (Cochrane, PubMed, Scopus, and Google Scholar) to gather data on Long COVID's impact on public health systems in low- and middle-income countries, with a particular focus on South Africa. The search strategy included key terms related to Long COVID, district health care systems, misdiagnosis, and primary care settings. Literature was included if it addressed diagnostic challenges or provided insights into health care practices in resource-constrained settings. Studies published between 2020 and 2024 were included to ensure the relevance of findings in the context of the COVID-19 pandemic. Data was thematically analyzed to identify patterns and gaps.

Results: The initial findings of the review show that district health clinics face significant barriers in diagnosing Long COVID, potentially due to resource limitations, high patient loads, and a lack of standardized diagnostic protocols. Overlap between Long COVID symptoms and other prevalent conditions like HIV/AIDS and

tuberculosis may also lead to frequent misdiagnoses. While training of healthcare workers in recognizing Long COVID symptoms is limited, further exacerbating underdiagnosis. The lack of systematic patient follow-up and comprehensive diagnostic tools may also contribute to gaps in care.

Conclusions: Long COVID remains an underrecognized condition in South Africa's district health clinics, highlighting the need for increased awareness, healthcare worker training, and development of standardized diagnostic pathways. Integration of Long COVID care into existing chronic disease management frameworks is a potential solution to improve care for affected populations. Addressing these challenges is crucial for ensuring equitable diagnoses of Long COVID in South Africa and treatment for patients' in the public health care system.



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Lifting the Fog - Treatment of Post-covid Brain Fog With EGB761

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Ginkgo biloba extract EGb761 is a phytopharmacological substance commonly used in treatment of mild cognitive impairment or as a supplement to improve poor concentration(1,2,3). A plethora of cognitive symptoms - commonly subsumed under the term "brain fog" - are often found in Long Covid patients, who mostly suffer from poor concentration or find post exertional malaise triggered by activities that demand concentration and focus.

With this retrospective data analysis we contacted all patients who had been prescribed EGb761 (ginkgo biloba extract) in the recommended daily dosage of 240 mg and who had visited my private practice within the last 12 months. Of those that had taken the medication 38.3% (n=23) reported no change in their symptoms but 61.7% (n=37) had reported improvements of various degrees. This shows statistically significant improvements of symptoms. Treatment with 240 mg daily of EGb 761 ginkgo biloba seems to improve subjective cognitive impairments like weakened concentration within a significant part of patients, especially in women. With EGb 761 being a kind of phytomedicine with little to no adverse effects off-label treatment in post-covid-syndrome induced cognitive impairment should be considered and additional studies should be conducted to further differentiate between different kinds of subgroups and factors.



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SARS-CoV-2 Viral Load and Cytokine Dynamics Profile Associated With Post COVID Condition

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According to WHO, post COVID-19 condition is defined as the continuation or development of new symptoms 3 months after the initial SARS-CoV-2 infection, lasting for at least 2 months with no other explanation. The broadness of this definition raises doubts at the time of diagnosis, so it is necessary to find biomarkers to narrow this definition and to elucidate the associated pathophysiology. We evaluated the dynamics of SARS-CoV-2 viral load (VL) and proinflammatory cytokines in people with COVID-19 looking for potential differences between post COVID and non-post COVID individuals.

Patients belonging to the COVID cohort of the Galicia Sur Health Research Institute who had nasopharyngeal exudate and plasma samples both at diagnosis of SARS-CoV-2 infection and at follow-up in the following 55 days were selected. Viral load was quantified in nasopharyngeal exudate by ddPCR, and proinflammatory cytokines (IL-1 β , IL-18, MIG, and IP-10) were measured in plasma by multiplex assay.

A total of 30 individuals met the inclusion criteria, from which 104 determinations were obtained during the study period for viral load and cytokines. Of them, 12 met criteria of post COVID

condition (41 samples) and 18 did not (63 samples). Patients who will develop post COVID condition tend to show a lower viral load after SARS-CoV-2 diagnosis than those who did not develop this condition (post COVID: 6985 [395-587142] copies/ml, non-post COVID: 148285 [14171-9768214] copies/ml; $p = 0.059$); however, in the post COVID group, viral load tended to be more prolonged in time than in those without condition (post COVID: 41 [35.8-46.2] days, non-post COVID: 46 [40.51.5] days, $p = 0.064$). Cytokines levels were similar in both groups, reaching the highest levels at the onset of the infection with a tendency to decrease over time. Interestingly, the post COVID group tends to have higher levels of cytokines than the non-post COVID group 30 days after diagnosis.

Lower baseline levels of the SARS-CoV-2 viral load and a prolonged time to achieve undetectable viremia are linked to post COVID condition. In addition, elevated cytokine levels one month after diagnosis also appear to be related to this condition.



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Addressing the Challenges of Long COVID: A Comparative Analysis of Definitions Across Europe

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Background: The COVID-19 pandemic has significantly impacted healthcare systems globally, leading to a growing concern over Long COVID, a condition affecting many patients after the acute phase of infection. Despite its widespread prevalence, there is no standardized definition or diagnostic criteria for Long COVID, complicating its management across Europe.

Aim: This study aims to analyze and compare the definitions of Long COVID used in European countries, highlighting the inconsistencies in clinical criteria and management practices.

Methods: A retrospective descriptive study was conducted through an online questionnaire distributed to key informants in 32 European countries.

Outcomes: The results show that the WHO's definition of Long COVID is the most widely used, with a 40.6% adoption rate among the participating countries. However, there is substantial variation in the definitions applied, with 56.7% of countries using more than one definition simultaneously, reflecting a lack of standardization and contributing to inconsistencies in patient care. Qualitative analysis revealed challenges in terminology, clinical criteria, and the implementation of diagnostic codes, contributing to inconsistencies in patient care.

Conclusion: This research highlights the urgent need for a unified definition of Long COVID to improve clinical management and streamline international data comparison. Standardized protocols and consistent criteria are essential to optimize treatment strategies and ensure effective communication between healthcare professionals and patients. Establishing consensus on Long COVID definitions would not only enhance the quality of patient care but also inform public health policies, addressing challenges in diagnosis and management. Collaborative efforts to develop uniform guidelines are crucial to overcoming the complexities associated with the treatment and care of Long COVID.



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A 12-Item Questionnaire to Assess Long COVID Stigma

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Background: Measuring the stigma attendant to long COVID has been an important but complicated challenge for researchers. Like other forms of health-related stigma, it has multiple dimensions thereby necessitating complex and lengthy testing procedures. Its symptoms however, including brain fog and fatigue, preclude measurement processes that are taxing for participants. Nevertheless, such foundational tools are pivotal to describing this social determinant of health and assisting patients and healthcare professionals in its management.

Material and Methods: We developed a 40-item questionnaire that prompted people about their experience of stigma, and we administered it to 145 patients of a long COVID clinic. We analyzed the measurement properties and the factor structure of the responses, and we used this information to select numerous combinations and numbers of items that represented the 6-factor structure while maximizing reliability and validity.

Results: We identified a set of 12-items with consistently high levels of test-retest and split-half reliability, internal consistency, and discriminant validity, while reproducing the 6-factor structure of the lengthier instrument.

Conclusions: A diagnosis of long COVID can devalue one's social status and discredit one standing in the community. The labeling, stereotyping, and discrimination prompts those with long COVID to conceal their status from family, friends, and acquaintances; avoid testing and treatments that might out them as having long COVID; and withdraw from social activities. A pivotal step in understanding long COVID stigma, developing interventions, and evaluating their effectiveness is developing tools to assess its form and intensity. The tool described here may serve those objectives.



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Consumption of Mental Health and Social Services by People With Long COVID and Its Relationship With Persistent Symptomatology: A Descriptive and Correlational Study

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Background: Approximately 10% of patients who have been infected with SARS-COV-2 have persistent symptoms that have reduced their quality of life and affect their mood. The aim of this study is to analyze the consumption of mental health services and social resources by people with persistent COVID and its relationship with the persistent symptomatology they present.

Material and methods: Cross-sectional descriptive and correlational study in which data were collected from 100 patients with persistent COVID. The variables of the study were: sociodemographic, clinical variables (number of persistent symptoms), and consumption of mental health and social services. A descriptive and correlational study was performed.

Results: The participants in this study show a high affectation reflected in the large number of residual symptoms they present (mean 16.47 symptoms). 100% of the patients had visited their general doctor (public or private). There is a considerable increase in the use of public and private mental health services (almost 20%). Social services are used by 8% of the sample. The bivariate analysis showed a correlation between the number of symptoms and visits to the family physician of the public health system (Pearson's P

0.242, p-value: 0.015), but not with the use of mental and health service.

Conclusion: Timely planning of patient-centered resources and services for post-COVID-19 care is needed.



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Exploring the Role of Pre- And Post-COVID Comorbidities in Long COVID Symptom Severity and Duration: A Multivariate Analysis

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Background: Long COVID, characterized by persistent symptoms following acute COVID-19 infection, has been hypothesized to be influenced by pre-existing and post-COVID comorbidities. This study explores the impact of cardiovascular, respiratory, and metabolic conditions on symptom severity and duration in Long COVID patients.

Materials and Methods: A cross-sectional analysis was conducted on 170 patients from the ARALONGCOV study, with a focus on pre- and post-COVID comorbidities (cardiovascular, respiratory, and metabolic issues). Symptom outcomes included fatigue duration, cognitive impairment, and respiratory symptoms. Bivariate and multivariate linear regression models were used to assess the associations between comorbidities and symptom severity, with interaction terms explored to determine potential compounded effects of multiple comorbidities.

Results: Analysis revealed that cardiovascular conditions were associated with an additional 4.6 weeks of fatigue, but this effect was not statistically significant ($p = 0.131$). Metabolic conditions showed a small positive effect on fatigue duration (1.5 weeks), but this too was non-significant ($p = 0.267$). Respiratory comorbidities did not significantly impact fatigue or respiratory symptoms. Interaction terms between cardiovascular and metabolic issues, and between metabolic and respiratory issues, did not yield meaningful results due to data limitations. Cognitive impairment was explored as a secondary outcome, but no significant associations with comorbidities were found ($p > 0.8$).

Conclusions: This study found no significant relationship between the presence of pre- or post-COVID comorbidities and the severity or duration of Long COVID symptoms. While there were trends suggesting increased fatigue in patients with cardiovascular and metabolic issues, these effects were not statistically significant. Further research with larger, more diverse samples is needed to confirm these findings and explore potential interactions between comorbidities and Long COVID outcomes.



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Exploring the Management of Long COVID by General Practitioners Across Europe: Practices, Challenges, and Future Directions

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Background: Long COVID, also known as Post-COVID Syndrome, has emerged as a significant public health challenge, characterized by persistent symptoms following acute COVID-19 infection. General Practitioners (GPs) are at the forefront of diagnosing and managing this complex condition. However, there is limited understanding of how GPs across Europe are currently addressing Long COVID, including the challenges they face, the resources available, and the variability in practices across different healthcare systems.

Aim: This study aims to provide a comprehensive overview of current practices, challenges, and resource needs of GPs in managing Long COVID across Europe.

Methodology: A cross-sectional survey will be conducted among GPs in Europe using an online platform. The survey will include both quantitative and qualitative questions to gather a wide range of data, including demographics, clinical practices, training, and challenges related to Long COVID. A snowball sampling method will be used, initially targeting members of the European General Practice Research Network (EGPRN) and the World Organization of Family Doctors (WONCA) Europe, who will then be encouraged to share the survey within their professional networks. Data will be analyzed using descriptive statistics, inferential

statistics, and thematic analysis to provide a detailed understanding of how GPs are managing Long COVID in primary care.

Expected Outcomes: The study is expected to yield valuable insights into the practices and challenges faced by GPs in managing Long COVID, highlighting gaps in training, resource needs, and potential areas for policy improvement. The findings will contribute to the development of targeted support mechanisms and guidelines to enhance the care provided to Long COVID patients across Europe.

Conclusion: This study will offer critical insights into how General Practitioners across Europe are managing Long COVID, a condition that continues to pose significant challenges in primary care. By identifying current practices, knowledge gaps, and resource needs, the research will help inform the development of more effective strategies and guidelines for Long COVID management. Ultimately, the findings will support GPs in delivering better care to patients affected by this complex condition and help shape future policies to ensure consistent and equitable healthcare across Europe.



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Long Term Outcomes of Hyperbaric Oxygen Therapy in Post COVID Condition: Longitudinal Follow-up of a Randomized Controlled Trial

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In February 2024, Aviv Clinics shared results from the Sagol Center for Hyperbaric Medicine and Research at Shamir Medical Center and Tel Aviv University from a longitudinal long COVID study highlighting a unique protocol of hyperbaric oxygen therapy (HBOT) as an effective treatment for those with long COVID symptoms. The primary objective of the study was to evaluate the long-term effects of a specific HBOT protocol on long COVID syndrome.

In a previous randomized controlled trial, significant improvements in cognitive, psychiatric, sleep, and pain symptoms among long COVID patients who underwent a unique protocol of HBOT were documented. This longitudinal follow-up included 31 patients from the original study who were treated with 40 daily sessions of HBOT. Participants were recruited more than one year after completion of their last HBOT session.

Quality of life, which was assessed through the SF-36 questionnaire, revealed the long-term results exhibited a similar magnitude of improvement as the short-term outcomes following HBOT across most patients. Sleep quality improvements were observed in global score and across five sleep domains with effect sizes of moderate magnitude during the short-term evaluation. These improvements persisted in the long-term assessment. Neuropsychiatric symptoms assessment following HBOT demonstrated a large effect size, and this effect persisted at the long-term evaluation. Both pain severity and pain interference had significant improvements during the short-term assessment post HBOT, which persisted at long-term.

This protocol involves the repeated fluctuations in pressure and oxygen concentrations, which activate metabolic pathways vital for regeneration. By delivering high oxygen concentrations, HBOT can enhance oxygen delivery to tissues, resulting in recovery of injured tissues permanent improvement. More specifically, at the subcellular level, HBOT restores mitochondria function and metabolism, attenuated by long COVID. HBOT's anti-inflammatory effects modulate the release of cytokines and inflammation associated with long COVID. By stimulating vasculogenic stem cells, HBOT induces angiogenesis, addressing the vascular damage or thrombosis caused by long COVID.

The finding that the clinical results were preserved after one year, reinforces that these are permanent changes driven by constant microstructural changes.



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Passive Transfer of IgG From Patients With Long-COVID Neurological Symptoms Induces Tactile Allodynia in Mice

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Between 15% and 30% of SARS-CoV-2-infected people still experience neurological symptoms (memory impairment, attention deficits, pain) more than 4 months after the onset of COVID-19. This condition, known as long-neuro-COVID, is poorly understood and might be explained by a persisting autoimmune response against nervous-derived self-antigens.

The aim of this study is to determine whether IgG autoantibodies from long-COVID patients can bind to central and peripheral nervous system epitopes and reproduce neuropsychiatric symptoms upon transfer into mice.

Long-COVID patients meeting the consensus WHO definition were included following a neuropsychological assessment. Age- and sex-matched asymptomatic individuals were used as controls. Total IgG were isolated using protein G purification and injected intraperitoneally into C57Bl6/J mice (8 mg/day) for four consecutive days. During the two weeks post-injections, depression and anxiety were assessed using the tail suspension test, the elevated-plus maze and the light/dark box. Spatial working memory was assessed using the Barnes maze and the Y-maze, mechanical allodynia was assessed using Von Frey filaments, and discomfort was evaluated using Facial Grimace Scale (FGS). Statistical analyses were computed using Two-Way ANOVA followed by a Bonferroni multiple comparison test.

Mice injected with IgG from long-COVID patients showed no difference with the control group in terms of anxiety ($p=0.7616$ for LD box ; $p=0.5683$ for Elevated-plus maze) or depression behaviors ($p=0.0956$), as well as no impairment of spatial memory ($p=0.4574$ for Barnes maze ; $p=0.8745$ for Y-maze). Mice receiving IgG from long-COVID patients displayed a significant decrease of paw withdrawal threshold in both hind paws, that was transient during the first week post-injections ($p<0.0001$). A low paw withdrawal threshold is correlated with an FGS score of 1 or 2 (p -value = 0.0004; r spearman -0.3811).

These preliminary data show that IgGs from long-COVID patients can hyperactivate the nociceptive pathways and produce, at least in mice, pain-related symptomatology. Further analysis will aim at identifying the PNS or CNS targets.



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Lived Experience of Long COVID Fatigue: A Descriptive Qualitative Study

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Background: Fatigue is the most common sequelae of COVID infection lasting longer than 4 weeks. Specific lived experiences of long COVID fatigue have not been documented systematically. The detailed descriptions of long COVID fatigue may provide hints on the underlying causes, assessment criteria, and management strategies.

This study aims to describe the specific features, accompanying symptoms, and temporal patterns of fatigue severity in long COVID fatigue patients.

Methods: A descriptive qualitative research design was adopted. Twenty-one adult patients who had ongoing fatigue symptoms for more than 4 weeks following COVID infection were recruited through the Internet and selected through purposive sampling. Data were collected through face-to-face, semi-structured interviews. Content analysis was used to code and categorize the interview data.

Results: Five descriptors were most commonly used to describe the feelings of fatigue, including feeling weak, drained, exhausted, apathetic, and sleepy. Subjects reported experiences of inadequate strength, shortness of breath, unwillingness to move, lethargy, not as good as in former times, feeling like a zombie, wobbly, and feeling pressure on the top of their heads. Fatigue was accompanied by aches and pains (headache, shoulder pain, back pain); muscular soreness and stiffness (whole body, lower back, thighs, calves); heart symptoms (fast heartbeat, palpitation, fluttered); and head symptoms (grogginess, dizziness). Three quarters of the subjects reported moderate to high severity; 85% experienced a gradual reduction in severity over time, with significant improvement by 6 months following infection. In the remaining 15% of subjects, fatigue persisted beyond one year following infection.

Conclusions: To better understand this problem, more qualitative studies should be conducted in a wider population. Research results of this nature provide insight for the development of long COVID fatigue assessment tool in identifying and monitoring this problem. Comparative studies on long COVID fatigue with other types of fatigue experiences may also provide diagnostic values.



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100 % Recovered After 3,5 Years of Long COVID (Diagnosis by UZ Leuven)

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¹none, ,

Long COVID was a rather neurological/immunological disorder in this Post-Long COVID patient (end of Feb. '20 - Oct. '23). Promising positive results, via a new series of soft trial treatments of the autonomic nervous system out of balance, have led to a cure for the Long COVID symptoms with, among other things, PEM.

This after 3.5 years. Since then, until today, September 2024, there has been no relapse. She has been 100% active again since the summer of 2023 as she was before the first Covid infection. What has helped her to become completely symptom-free and eventually recover, is a GENTLE APPROACH to the autonomic nervous system, with:

- Understanding among fellow LC patients in the various Facebook patient groups in Belgium and the Netherlands, in contrast to the disbelief in the medical world.
- Fascia therapy, about 50 sessions of 'connective tissue massage' in total (for a better blood flow to tissues and organs and calming of the nervous system),
- Six B12 injections (helped against hair loss, brittle nails and muscle pain),
- Finally a doctor who did listen to her symptoms, showed empathy, recognized Long COVID for the first time and proposed a trial therapy 'Neural Therapy' that built on what DID already help her (NT for a resetting of the autonomic nervous system),
- Only afterwards (when all muscle and nerve pains had disappeared) six weeks of daily swimming in a spa with thermal water, to strengthen and activate the muscles again (this was a real boost for the mitochondria/energy factories of the cells),
- Finally, the trial therapy 'hyperbaric oxygen therapy' for 2 weeks that could replace the connective tissue massage of the physiotherapist with a more intense treatment (and create new capillaries in the tissues),

- And also the refusal of all booster shots, after the first two vaccinations.



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Neutrophil to lymphocyte ratio and platelet to lymphocyte ratio can predict the severity in COVID-19 patients from Ethiopia: A Retrospective Study

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Background: Coronaviruses are a broad family of pathogens that can cause mild to severe respiratory illnesses. Due to a strong inflammatory response and a weak immunological response, viral pneumonia inflammation, like COVID-19, displays an unbalanced immune response. Therefore, circulating biomarkers of inflammation and the immune system can serve as reliable predictors of a patient's prognosis for COVID-19. Hematological ratios are reliable markers of inflammation that are frequently utilized in pneumonia, primarily in viral infections with low cost in underdeveloped nations.

Purpose: Study the role of the neutrophil to lymphocyte ratio (NLR), lymphocyte to monocyte ratio (LMR) and platelet to lymphocyte ratio (PLR), in predicting the severity of COVID-19 patients.

Methods: An institutional-based retrospective study was done on 105 hospitalized COVID-19 patients at the University of Gondar comprehensive specialized referral hospital, Northwest Ethiopia. Patients were categorized as not severe, severe, and critical. The laboratory evaluations that were gathered, evaluated, and reported on included the total leucocyte count (TLC), absolute neutrophil count (ANC), absolute lymphocyte count (ALC), absolute monocyte count

(AMC), NLR, LMR, and PLR. For continuous variables, the Kruskal-Wallis test and Wilcoxon-matched-Pairs signed test were employed to evaluate whether there were any differences between them. For NLR, PLR, and LMR, receiver operating curve (ROC) analysis was utilized to establish the ideal cut-off values. P-value < 0.05 was considered a statistically significant association.

Results: ANC, NLR, and PLR were highest in the critical group ($p=0.001$), while this group had the least ALC and LMR ($p=0.001$). We calculated the optimal cut-off values of the hematological ratios; NLR (8.4), LMR (1.4), and PLR (18.0). NLR had the highest specificity and sensitivity, at 83.8% and 80.4%, respectively.

Conclusion: NLR is a predictor for severity in COVID-19. Whereas, MLR could not be a good predictor for severity in COVID-19.



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Quality of Life and Neuropsychological Evaluation of a Cohort of Patients With PASC of More Than 12 Months of Evolution in a Tertiary Hospital

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Introduction: SARS-COV-2 has extensive morbidity and mortality. It is known that some patients persist with symptoms for more than 3 months, which is currently known as Post-Acute-SARS-COV-2 Syndrome (PACS).

PASC points to highly variable clinical manifestations. It can incorporate several conditions with different etiologies and more than one mechanism, even in the same patient. The SARS-COV-2 pandemic has had dire health, economic and social consequences.

Objective: We propose to determine the quality of life and the neuropsychological evaluation of a cohort of patients with PASC.

Material and methods: An observational and descriptive study has been designed included all patients reviewed in consultations after SARS-CoV-2 acute infection from September 2020 to March 2022 at the Virgen de la Arrixaca University Hospital. After a 1-year follow-up, those patients who persisted with symptoms were evaluated to complete an in-person questionnaire and a neuropsychological assessment.

Results: Of 404 patients initially evaluated, 60 patients persisted with symptoms for more than 12 months, of which 38 came for evaluation. Our sample consists of 38 patients with a predominance of women (21 vs 17) with an average age of 54,92 years (SD 10,65). Spanish nationality (34; 89,5%), not vaccination against SARS-Cov-2 (27; 71%) and hospitalization during

acute infection (30; 78,9%) predominates. The average duration of symptoms was 18,18 months (SD 6,75). Dyspnea was determined with the mMrc whose mean and SD on this scale is 1,61 (SD 1,26), quality of life was self-reported using the visual analogue scale of the Euroqol with a mean score of 5,38 (SD 1,92). In our sample the mean PCFS is 1,58 (SD 1,13). Mental health was assessed using GAD 7 anxiety scales with a mean score of 7,18 (SD 5,31) and depression with the PHQ-9, a mean score of 7,87 (SD 6,24) was obtained. The evaluation Cognition was performed using the Prefrontal Symptom Index (PSI) with a mean score of 40,97 (SD 32.92%) and the Montreal test (MoCA) whose average was 25,76 (3,85).

Conclusions: In our cohort, patients have both physical and mental health problems, as reflected in the scales, functional tests and neuropsychological evaluation.



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Presentations to the Emergency Department Post-admission with COVID-19: A Retrospective Chart Review

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Background: Post COVID-19 syndrome or “Long COVID”, is heavily associated with increased duration and severity of illness following recovery from COVID-19.

The aim of the study was to determine the characteristics and outcomes of patients with subsequent presentations to an Emergency Department (ED) following positive COVID-19 PCR diagnosis.

Methods: This was a retrospective chart-review data from patients admitted to Austin Health ED who had a confirmed positive COVID-19 PCR, for the period July 2020 – August 2020 and October 2021. All patients who received a positive COVID-19 PCR and met the inclusion criteria were eligible. The primary outcomes were number of subsequent presentations and long covid symptoms.

Results: Among the 254 patients who met the inclusion criteria, 127 tested positive during Alpha wave 2020, and 126 tested positive during Delta wave 2021. During the Alpha wave, 25 of 127 (20%) patients had subsequent presentations to ED. During the Delta wave of October 2021, 23 of 126 (18%) patients had subsequent presentations to ED. During both Alpha and Delta waves, the strongest predictor of representations was Shortness of Breath (91%) and was associated with a higher triage category. Patients who presented to ED with a higher triage category had several associated comorbidities; T2DM (75%), active cancer (21%), hypertension (72%) and cardiac illnesses (60%). Patients with associated comorbidities had an increased representation rate to ED following discharge.

Conclusion: There was a higher proportion of ED representations post COVID from the alpha wave, with the commonest diagnoses of Congestive Heart Failure.



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Features of Somatic Disorders and Psychopathological Manifestations in Women in the Post-COVID Period

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Background: SARS-CoV-2 is characterized by a systemic effect on the body and is associated with a high frequency of somatic, neurological, and neurocognitive disorders, with a tendency to persist in the post-COVID period. In this regard, the aim of our study was to assess the nature of health complaints, frequency of occurrence, structure, and characteristics of general somatic and mental disorders in people in the post-COVID period.

Material and Methods: The main group (n = 1000) was represented by people who had recovered from COVID-19 at ages 18 to 60. As part of the study, an extended questionnaire was conducted among the examined persons, aimed at identifying the consequences that developed in the period from 4 weeks to 12 months after the disease.

Results: The study included 289 (28.9%) men and 711 (71.1%) women. The average age was 40.2±11.8 years. More than half of the respondents were permanently employed or studying (72.3%), while 17.9% indicated a high level of physical activity before COVID-19. 76.6% of respondents had a mild form of COVID-19; in 23.4% of cases, the disease was moderate. Women complained more intensely of hair loss (p < 0.001), shortness of breath (p = 0.04), and an irregular heartbeat (p = 0.007). Clear gender differences in the intensity of post-COVID psychopathological manifestations were revealed. Women complained more about high fatigue (p = 0.004), general malaise (p = 0.04), lower activity, and an inability to cope with everyday workload (p = 0.008). They had more severe dysmnestic disorders (p = 0.006) than men. Women were characterized by greater anxiety for loved ones (p = 0.01) and insomnia (p = 0.02). With the age of the respondents, the

intensity of psychopathological manifestations such as rapid fatigue (p<0.05), insomnia (p<0.05), as well as the intensity of general somatic complaints (urination disorders (p<0.05), shortness of breath (p<0.05), pain, and heaviness in the chest (p<0.05), increased.

Conclusion: The preliminary results of our study showed that special attention should be paid to women at the stage of treatment of acute infection and rehabilitation, due to the higher incidence of psychoneurological complications of COVID-19 in them.



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The Descriptive Profiles of Post-acute COVID Syndrome (PACS) Among COVID-19 Survivors in a Tertiary Hospital in Malaysia

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Background: Recent studies have shown a significant increase in cases reported from patients with the persistence of Post-Acute COVID -19 Syndrome (PACS) or Long COVID. The condition encompasses many physical and psychological symptoms, posing significant challenges to healthcare systems and patient quality of life. This study aims to profile the prevalence and severity of PACS in post-COVID survivors up to 6 months post-infection. Quality of life (QoL) was assessed using validated tools such as the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder Scale (GAD-7).

Methods: A longitudinal study was conducted between November 2021 and March 2024 using an online REDCap electronic data capture tool questionnaire with assistance from the researcher. The researcher approached the patients who acquired SARS-CoV-2 infection, confirmed by a positive SARS-CoV-2 polymerase chain reaction or rapid antigen test, and subsequently attended the University Malaya Medical Centre (UMMC), either ward or clinic, for enrolment. The survey collected data on the frequency and severity of post-COVID symptoms, as well as the patient's anxiety levels and mental health status, measured at two weeks, six weeks, and six months post-infection. Demographic information, medical history, and COVID-19 vaccination status were all documented at the beginning of the study.

Results: A total of 133 participants were recruited, including 56 (42.1%) males and 77 (57.9%) females, predominantly Malays 87 (65.4%), with a median age of 42 years. Six months post-discharge, all 45 participants (100.0%) reported at least one symptom. The most common symptoms were mental health issues 41 (91.1%), sleep disturbances 40 (88.9%), skin issues 36 (80.0%), and fatigue, memory problems, and ear-nose-throat issues 33 (73.3%) each. 3 (6.7%) had moderate to severe symptoms of anxiety, whereas 5 (11.1%) had moderate to severe symptoms of depression.

Conclusion: Long COVID, particularly its neuropsychiatric manifestations, continues to be a pressing concern among patients at the UMMC. Our findings underscore the significant burden of persistent symptoms that affect the quality of life and functional status of many COVID-19 survivors. This highlights the urgent need for targeted interventions and comprehensive care strategies to address the unique challenges posed by Long COVID.



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Characterising Post COVID-19 Vaccination Syndrome in an International Cohort: Similarities and Differences With Long COVID

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Post-acute COVID-19 syndrome (PACS or Long COVID) is a complex chronic disease afflicting millions of people. There is significant overlap between Long COVID and other complex syndromes including myalgic encephalomyelitis/chronic fatigue syndrome, postural orthostatic tachycardia syndrome, fibromyalgia/chronic pain syndrome, small fiber neuropathy, mast cell activation syndrome, and post viral and post vaccination syndromes.

Post COVID-19 vaccination syndrome (PCVS) is a complex chronic illness that presents with a broad range of persistent symptoms including systemic, neurologic, cardiac, and immunological. Very few studies have investigated this population so relatively little is known about symptom prevalence and severity, expected clinical evolution, impact on daily functioning, potential risk factors, recovery, and relative similarities and differences with other illnesses.

We conducted an international survey study of people with PCVS which includes 1200 respondents. We estimated the prevalence, severity, and time evolution of 137 symptoms across many organ systems. We measured the impact on health, daily functioning, pre/post COVID infections, and pre-existing conditions. The study also investigates what tests, diagnoses, and treatments have been tried and their perceived effect.

Many PCVS respondents have not yet recovered (94%) and continue to experience significant symptoms many months and years after onset. Participants experienced an average of 37.8 ± 24.7 (mean \pm STD) symptoms. The most frequent symptoms were fatigue, cognitive dysfunction

(brain fog), and exercise intolerance/post-exertional malaise. Most respondents were women (68.9%) and between the ages of 35 and 64 (68.4%).

We find the results in our study to be similar to those from studies on cohorts with Long COVID or other complex chronic conditions. Among noticeable differences, there seems to be a higher prevalence of paresthesia in PCVS (70%) than in PACS (~50%).

Interestingly, only a minority (20.9%) reports having had COVID before the onset of PCVS. Moreover, among those that had COVID after onset of PCVS, more than a third (34.9%) report worsening symptoms.

Further research is needed to understand the underlying mechanism in both PACS and PCVS. Similarities in these two syndromes suggest a possible common pathophysiology and therefore successful treatment strategies may overlap. Further studies are needed in hopes of finding therapeutic options for these two debilitating diseases.



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Sexual Function and Satisfaction Among Long COVID Haulers: A Cross-Sectional Online Survey Protocol

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Background: Studies show that around 10–20% of infected people with SARS-CoV-2 may develop new or present ongoing symptoms 3 months after the initial SARS-CoV-2 infection, lasting for at least 2 months with no other explanation. Such circumstance is termed post-COVID condition or long-COVID (LC). Some LC symptoms contribute to alterations in sexual function (Leitner et al., 2024) and need to be addressed for improving their deteriorated quality of life (Sansone et al., 2022). However, there is a notable scarcity of research examining persistent sexual dysfunction in individuals affected by this condition (Khan et al., 2023).

Therefore, the present study aims at: 1) evaluate the sexual function and satisfaction among individuals reporting prolonged symptoms of COVID-19; 2) to explore the association between fatigue and disability severities with sexual function and satisfaction and 3) to assess if long-covid haulers have been asked by any health care professional about sexual function or sexual health in the context of their Long-COVID syndrome.

Material and methods: A multi-cultural, cross-sectional online survey is going to be conducted to assess sexual function and satisfaction among participants with long-COVID symptoms. Participants are invited to participate in the study if they: a) are 18 years old or older, b) present long-COVID symptoms, c) are fluent in at least 1 of 5 languages, including English, French, German, Spanish or Portuguese.

The survey battery is composed of the following instruments: 1) sociodemographic questionnaire; 2) long COVID sexual function questionnaire; 3) Patient-health questionnaire (PHQ-9); 4) Generalized Anxiety Disorder questionnaire (GAD-7), 5) New Sexual Satisfaction Scale (NSSS), 6) Fatigue Assessment Scale (FAS), 7) WHO Disability Assessment Scale (WHODAS 2.0)
A convenience sample will be generated through the dissemination of the study via social media channels targeting long COVID units, institutions and professionals involved in LC care and patient associations. Descriptive statistics will be performed (with a power of 0.80 or greater and with a significance level set at $\alpha = .05$).

Conclusions: This study will allow us to better understand how Long-COVID haulers perceive sexual function and satisfaction, helping to formulate recommendations for assessment and interventions tailored to this population.



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Patient Legislative Advocacy in California

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Due to the severe shortage of medical professionals qualified to treat Long Covid patients in California in the United States, I proposed bill AB 3119 (https://digitaldemocracy.calmatters.org/bills/ca_202320240ab3119), which asks the California Medical Board to consider adding a Long Covid class to the continuing education program for medical doctors, osteopaths, physician assistants, and nurse practitioners.

This bill may prevent the Long Covid crisis from bankrupting the state's disability and unemployment systems and creating an even worse budget deficit. Long wait times for appointments mean people have to stay on disability for a long time. Some people lose their jobs because their Long Covid symptoms prevent them from working.

With 400 million people worldwide with Long Covid, this growing crisis is projected to cost \$1 trillion — equivalent to 1% of the global economy.

My story: I am the citizen sponsor of this bill because I struggled to find medical care for my Long Covid.

Finding medical care across the state was an uphill battle. My closest Long Covid clinic at Stanford had a five month wait for an appointment. The situation was no better elsewhere in California. One clinic in Los Angeles required an in-person visit, which meant an 8-hour car trip for a medical appointment—impossible for most people with chronic fatigue.

I would like to present my story and show how patients can advocate within their legislative system to increase Long Covid medical care by adding Long Covid education to the continuing education program for medical providers.

Note: The bill unanimously passed both houses of the California legislature and is currently awaiting

the governor's approval. The governor has until 30 September to approve or veto the bill. If the bill is vetoed, then I will have to rescind my abstract proposal from the conference.



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The Association of Neutrophil Extracellular Traps With Microclots Contributes to Long COVID

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In the first months of the epidemic, we are among the first to postulate that neutrophil extracellular traps (NETs) are key player of the COVID-19 pathophysiology. We previously observed elevated formation of NETs in COVID-19 patients, and their association with disease severity in two clinical studies. In addition, elevated NETs markers persisted in COVID-19 post-acute phase.

We hypothesize that NETs production are at the interconnection of three positive feedback loops which are initiated in the acute phase of SARS-CoV-2 infection, and which involve inflammation, immunothrombosis and autoimmunity. The ensuing strong neutrophil stimulation leads to a progressive amplification of an exacerbated and uncontrolled NETs production, potentially persisting for months beyond the acute phase of infection. This continuous self-stimulation of neutrophils leads in turn to systemic inflammation, micro-thromboses, and the production of autoantibodies, whose significant consequences include the persistence of endothelial and multi-organ damage, and vascular complications. The persistence of vasculo-thrombotic complications has been put forward as a possible contributing factor in the long COVID (LC) syndrome.

Given the recently reported separate demonstration of the association of LC with elevated levels of fibrin amyloid microclots (FAM) and with those NETs, markers that are linked to thromboinflammation, this study considers the association of FAM with NETs.

The results show that NETs markers are quantitatively and structurally associated with the size and number of FAM in patients with LC. These markers showed a strong diagnostic performance, both independently and when combined.

Our study revealed that NETs may be a component of circulating FAM, We suggest that higher NETs formation promotes the stabilization of FAM in the circulation, leading to deleterious effects which contribute causally to the LC syndrome.

Thierry AR, Roch B. Neutrophil Extracellular Traps and By-Products Play a Key Role in COVID-19. doi: 10.3390/jcm9092942.

Pisareva E et al. Persistence of neutrophil extracellular traps in post-acute phase COVID-19 patients. doi: 10.1002/jmv.28209.

Thierry AR, Salmon D. Inflammation-, immunothrombosis-, and autoimmune-feedback loops may lead to persistent neutrophil self-stimulation in long COVID. doi: 10.1002/jmv.29887.

Thierry et al. Circulating microclots are structurally associated with Neutrophil Extracellular Traps and their amounts are strongly elevated in long COVID patients. doi.org/10.21203/rs.3.rs-4666650/v1



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SuperCAP Study: A Clinical Trial Testing a Distance Cognitive Program for Post-COVID Condition Based on Patients' Experience

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Background: Cognitive problems and fatigue are two of the most frequent and disabling symptoms in post-COVID condition. Programs aimed at addressing those symptoms are urgently needed, since there are no available treatments to prevent or manage them so far. We present the SuperCAP Study, a project to design and test a distance program for improvement of cognitive, functional, and emotional status of people with post-COVID condition.

Material and Methods: SuperCAP Study includes 2 stages: an initial pilot study and posterior development of a clinical trial (Clinicaltrials.gov identifier: NCT06315894). Both study populations will comprise people with post-COVID condition attended at Germans Trias i Pujol Hospital, Badalona, Catalonia, Spain. The pilot study will consider pre- and post- experience using an initial version of the program. The clinical trial will consist of a randomized controlled study investigating the intervention (N=60, 2:1 scheme, experimental arm: 40 subjects; control: 20). Primary endpoint will be change in self-reported cognitive functioning (test WHODAS 2.0, subscale D1); secondary endpoints will include change in performance-based cognitive functioning (NPZ12 score), daily functioning (IADL scale), quality of life (EuroQol-5D), and depression (PHQ9) and anxiety symptoms (GAD7).

Results: At the moment (September 2024), the pilot study has finished. Before its initiation, 2 previous workshops were developed, one for people with post-COVID condition, another for professionals involved in their healthcare. Qualitative information was gathered, oriented to design a first version of the program. This included, mainly, cognitive training, psychoeducative videos, and personalized self-reports. A total of 60 individuals participated. High levels of satisfaction are shown, as well as positive attitudes towards the project. Key improvements have been also offered. Next step in the project is using the feedback provided to improve the intervention and initiate the clinical trial (expected in the beginning of the next year, January 2025).

Conclusions: A distance program for improvement of cognitive, functional, and emotional status of people with post-Covid condition is being designed and initial test has been developed. SuperCAP Study seeks multiple advantages, among them: using telehealth, proposing non-pharmacological interventions, and, very uniquely, being based on the experience and opinion reported by people with post-COVID condition directly.



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Mental Health Status of People With Long COVID and Its Relationship With Clinical and Psychological Constructs as Self-Efficacy, Patient'S Activation and Health Literacy

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Background: Long COVID patients suffer a negative impact on their quality of life and there is still a need to better understand the individual experience and circumstances surrounding these patients. The objective of this study is to analyze the role of the mental health status in clinical and psychological constructs such as self-efficacy, patient 's activation and health literacy.

Material and methods: 100 patients suffering from Long COVID participated in this study. The main variable was depression and anxiety measured by HADS. Other variables collected were: sociodemographic data, number of symptoms, sleep quality and personal constructs as self-efficacy, patient's activation and health literacy. A bivariate and multivariate analysis were performed.

Results: Mental health status was related with number of symptoms, sleep quality and personal constructs as self-efficacy, patient 's activation and health literacy. Multivariate analysis confirmed this relationship, and these variables are predictors of mental health.

Conclusion: It is relevant to analyze and treat mental health disorders in people with long covid since it has a relationship with clinical and psychological constructs relevant for their quality of life.



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Risk Factors of Prolonged Symptoms of COVID-19 Among Tertiary Government Hospital Workers: A Case-Control Study

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Background: Studies have shown that around 30-40% of patients who acquire COVID-19 infection have persistent symptoms. According to the Department of Health (DOH), approximately 10 to 15% of Filipinos infected with COVID-19 developed prolonged symptoms of COVID-19.

Objective: To determine the risk factors for the development of prolonged symptoms of COVID-19 among tertiary government hospital workers.

Methods: This is a case-control study of patients infected with acute COVID-19 infection from January 2021 to March 2022. Patients who consented were assessed according to the presence or absence of prolonged symptoms of COVID-19, using an online questionnaire via Google Form, for the presence of risk factors for the development of prolonged symptoms of COVID-19: COVID status, co-morbidities, workplace exposure, vaccination status, age, smoking history, period of infection, and sex.

Results: The most common prolonged symptoms of COVID-19 were persistent fatigue (39.76%), forgetfulness (33.73%), anxiety (32.53%), sleeping less (27.21%), and joint pain or swelling (22.89%). Having a 2nd infection of COVID-19 (OR: 2.53, p-value: 0.023) and no COVID-19 vaccine (OR: 5.338, p-value: 0.038) were positively associated with the development of prolonged symptoms of COVID-19.

Conclusion: This provides local baseline data on possible risk factors for the development of prolonged symptoms of COVID in healthcare workers. Hospital workers with prolonged symptoms of COVID-19 are females in the younger age group who had symptomatic acute COVID-19, underwent home isolation, and have no co-morbidities. The most common presentations were persistent fatigue, forgetfulness, anxiety,

decreased sleep, joint pains, and/or swelling. Being unvaccinated and having a 2nd infection with COVID increased the risk of developing prolonged symptoms of COVID-19. The study focused on hospital workers, so the results should be taken cautiously when applied to the general population. A high index of suspicion is needed when hospital workers present at the Employee Clinic with the symptoms mentioned earlier and a history of COVID-19 infection. Healthcare workers who have not been infected with COVID-19 are encouraged to be vaccinated with any COVID-19 vaccine.



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Management of Patients With Long COVID: Roles of Nurses in Healthcare Pathways

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Background: The term “Covid Long” refers to a variety of symptoms, occasionally unexplained, persisting for weeks after infection with COVID-19. According to WHO criteria, 10-20% of patients infected with COVID-19 develop Long Covid. This study aims to explore the various roles played by nurses in healthcare of patients with Long Covid.

Methods: From October 2022 to June 2023, we conducted a qualitative study among healthcare professionals in France and enrolled seventeen participants in our study. Semi-structured interviews were conducted with nurses working across various care sectors in France, including private practice, hospitals, schools, and research. We carried out a thematic analysis to identify emerging themes.

Results: The analysis revealed a general lack of knowledge about this syndrome, which appears complex for nurses. Nurses play a multi-faceted role in the care of patients with long COVID syndrome. As well as managing technical care, they provide emotional support to patients. They educate patients to help them better manage their symptoms. Some nurses are involved in research projects on Long Covid and the role of coordinator appears to be essential in ensuring holistic care for these patients.

To guarantee this holistic approach, interprofessional collaboration is clearly necessary, to satisfy the multiple needs of these patients. This

is more important as nurses have identified similarities between the symptoms of Covid Long and other chronic illnesses such as fibromyalgia and chronic fatigue syndrome.

Conclusion: The management of Covid Long requires a multidisciplinary approach. The results of this study allow us to apprehend the responsibilities of nurses and to optimize collaboration between the various professionals involved in a care pathway for Covid Long patients. This recognition of roles could make it possible to significantly improve organizational quality in the management of other chronic diseases, and thus improve healthcare pathways.



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Lockdown-Induced Sedentarism Aggravates Changes in Appetite and Sleep Corresponding to Post Acute Sequelae of COVID-19 (PASC): A Retrospective Analysis

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Background: Unresolved inflammation and viral persistence are strong presumable causes of Long COVID. However, their precise mechanism(s) remains poorly understood. Besides, the role of underlying environmental triggers such as prolonged social distancing and Lockdown-induced sedentarism (LIS) remains largely underexplored.

Method: We perform a retrospective analysis of our online nutritional survey in 2021 involving healthy (non-infected) adult individuals (n=199, 40.2% females) of Indian origin (mean age 29±8.62 years), who were fully/ partly working from home (WFH) and had collectively lived through similar degrees of spatial confinements following the first wave of COVID-19. We statistically analyze emergent features in their home environment, dietary habits, physical activity, and sleep quality. Coupled with findings from parallel studies, we extrapolate our observations for their plausible associations with the post-infectious syndrome symptomatology in survivors of COVID-19 to better understand Long COVID syndrome.

Results: Two-thirds of the participants (67.3%) had perceived noticeable changes in their diet, and contrary to Western societies, reported largely healthy dietary patterns, such as “increased consumption of fresh foods” (56.3%) and vitamin supplementation (62.3%) during the lockdown. Despite that, challenges such as weight gain (48.2%) and “more erratic sleep” (33.6%) were prevalent themes. Critically, most (70.8%) failed to comply with the (WHO) “minimum 150-minutes per week” moderate to vigorous physical activity recommendations. When analyzed (Chi-square analysis, ANOVA & regression analysis), participants with erratic sleep (n=67) showed a

significant positive association ($p<0.05$) with overall physical activity level (PAL) score but no observable interactions with overall diet score, body mass index (BMI), or WFH status. Loss of appetite, undesirable weight gain, etc., failed to correlate with changes in the home environment, dietary variables (e.g. “increased sugar/fat intake”), or BMI, except with their “overall PAL score” ($p<0.05$).

Subsequently, the literature survey reaffirmed our understanding of LIS and several post-infectious sequelae interrelationships.

Conclusion: Lockdown-induced sedentarism has independently predisposed a subset of healthy individuals to adverse health outcomes. Combined with latent virome pathophysiology, LIS may have triggered offset in biological mechanisms to reinforce Long COVID syndrome. Rethinking sedentarism, both as a cause and a symptom, for mitigating long COVID, is warranted.



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Exploring the Feasibility of a Caloric Restriction Diet as an Intervention for Long COVID in Adults: A Pilot Randomized Controlled Trial

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Background: Long COVID Syndrome (LCS) is characterized by persistent symptoms following COVID-19 infection, including fatigue, cognitive dysfunction, and respiratory issues, which pose significant public health challenges. Emerging evidence suggests that chronic inflammation may play a significant role in the pathophysiology of LCS. Therefore, dietary interventions such as caloric restriction may offer therapeutic benefits by modulating immune responses and enhancing metabolic processes. The Buchinger-Wilhelmi method, a structured and medically supervised caloric restriction regimen, is proposed as a potential intervention to reduce inflammation, and improve overall health outcomes in individuals with LCS.

Objectives: To evaluate the feasibility of a 7-day ambulatory caloric restriction intervention using the Buchinger-Wilhelmi method in adults with LCS. The study will assess the feasibility of this intervention and explore its impact on clinical, biological, and psychological parameters over a 4-week period.

Study Design and Population: The study will enroll 20 adults aged 18 to 64 diagnosed with LCS. Participants will undergo a caloric restriction regimen based on the Buchinger-Wilhelmi method, with daily monitoring and support provided throughout the intervention. Eligibility criteria: normal Body Mass Index (BMI) and marginal iron levels. Exclusion criteria: uncontrolled chronic diseases, severe organ conditions, active inflammatory or psychiatric

disorders, pregnancy, recent surgery, abnormal BMI, recent weight loss, addictions, or severe fasting reactions.

Methodology: The intervention includes an initial bowel cleanse followed by a 7-day caloric restriction period with a maximum of 350 kcal/day from vegetable broths and juices. Data collection will include blood draws, stool samples, and symptom tracking via the REDCap application. Biological samples will be analyzed for inflammatory markers, metabolic changes, and shifts in gut microbiota.

Primary outcomes: will focus on the feasibility metrics of the fasting intervention, such as adherence and safety.

Secondary outcomes: will assess changes in clinical symptoms, inflammatory markers, psychological well-being, and gut microbiota composition.

Significance and Conclusion: If feasible, periodic fasting could emerge as a low-cost, accessible treatment option for LCS, potentially alleviating symptoms and enhancing quality of life. This pilot study will provide essential data to support the design of larger scale randomized controlled trials aimed at further exploring the efficacy of fasting in managing LCS.



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'Back to Human': Trajectory of COVID-19 Vaccine Hesitancy and Acceptance for Public Health in Bayelsa State

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Rationale: The COVID-19 pandemic has significantly exacerbated public health challenges, particularly vaccine hesitancy, in Bayelsa State, Nigeria. Vaccine hesitancy, which stems from skepticism rather than outright refusal, threatens public health efforts and contributes to the resurgence of vaccine-preventable diseases. Addressing this issue requires an understanding of the sociocultural, organizational, and individual factors that influence vaccine acceptance.

Objective: This study aims to investigate the factors driving vaccine hesitancy and acceptance in Bayelsa State using the 5As model—Access, Affordability, Awareness, Acceptance, and Activation. The study also seeks to provide insights to policymakers, public health officials, and immunization staff to improve vaccine uptake through targeted risk communication and community engagement.

Methods: This study employed a mixed-methods approach to examine vaccine hesitancy and acceptance in Bayelsa State, Nigeria.

Results: Findings indicate that despite the importance of access, affordability, and awareness in vaccine uptake, acceptance and activation play critical roles. Public attitudes towards vaccination have improved through advocacy, community involvement, and media outreach efforts led by health agencies and international partners. Data from the ongoing Scale 3.0 vaccination implementation show an increasing trend in vaccine uptake across the eight Local Government Areas (LGAs) of Bayelsa State, driven by community-based leadership and integrated disease surveillance systems.

Conclusions: Vaccine hesitancy remains a significant barrier to achieving high vaccination rates. Building public trust through transparent

communication, fostering community engagement, and addressing individual concerns are essential for overcoming resistance. Effective risk communication strategies that resonate with the public's emotions and needs are crucial in enhancing vaccine acceptance.

Recommendations: Strengthen community engagement through collaborations with local leaders and organizations, improve risk communication strategies to build trust, foster autonomy, and address vaccine hesitancy, utilize data-driven approaches to inform immunization policies and practices at both national and subnational levels as well as continue research to explore the sociocultural dynamics that influence vaccine acceptance and hesitancy.



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COVID-19 Disease in Children Hospitalized at the Pediatric COVID-19 Unit of P1, Ibn Rochd University Hospital Center - Casablanca: An Epidemio-Clinical Study

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Background: Coronavirus disease 2019 (COVID-19) is an emerging infectious disease caused by SARS-CoV-2. While adults are primarily affected, children typically experience mild disease, although they may present with Multisystem Inflammatory Syndrome in Children (MIS-C). Comorbidities may aggravate the disease. The aim of our study is to describe the epidemiological, clinical, paraclinical, and evolutionary profiles of children hospitalized with COVID-19 in the P1 infectious disease department during the pandemic.

Methods: We conducted a retrospective study of pediatric patients diagnosed with COVID-19 from March 2019 to October 2021 at the Department of Pediatric Infectious Diseases and Clinical Immunology. Clinical, paraclinical, and therapeutic data were collected from the hospitalization records of patients with positive COVID-19 PCR results.

Results: Our study involved 131 hospitalized children. The mean age of patients was 5.3 years (34 days to 14 years), with a sex ratio of 1.1. The most frequent clinical signs were fever (73%), headaches (30%), vomiting (23%), and diarrhea (21%). Fifteen percent were asymptomatic, 13% experienced nausea, and 11% reported headaches. The most common comorbidity was hematological pathologies, observed in 41.86% of cases. Lymphopenia was reported in 47.1% of patients, 47.93% had elevated CRP, and 22.13% showed

radiological abnormalities. Clinical presentations included isolated COVID-19 (37%), COVID-19 with comorbidities (33%), and MIS-C (30%). The outcome was favorable, with recovery in 95.42% of cases. There were 4.58% deaths, including five patients with comorbidities: 2 with malignant non-Hodgkin lymphomas (LMNH), 1 with primary immunodeficiency (PID), and 2 with bronchopulmonary dysplasia (BPD).

Conclusion: These findings demonstrate that isolated respiratory COVID-19, COVID-19 with comorbidities, and MIS-C are the three main presentations of SARS-CoV-2 infection in hospitalized children. The proportion of male patients is higher than reported in the literature, with many comorbidities. MIS-C poses a significant risk to life prognosis. Determining the pathophysiology of MIS-C remains a particular challenge.

