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Post-COVID-19 condition: current evidence and unanswered questions

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As of July 2022, over 555 million cases of COVID-19 have been recorded globally, with more than 8·5 million confirmed cases reported in the African region.[1,2] Various studies have been published in the past 2 years identifying persisting symptoms in individuals who had COVID-19 in different countries across the globe.[3] On the basis of this emerging condition—persisting symptoms linked to COVID-19 extending past the acute phase of infection—the UK's National Institute for Health and Care Excellence (NICE) published a guideline for clinicians on the long-term effects of COVID-19.[4] The NICE guideline goes beyond clinical guidelines and defines the terms associated with these persistent signs and symptoms. The guideline distinguishes between the terminologies long COVID and post-COVID-19 condition, formerly used interchangeably. The term long COVID now refers to signs and symptoms that continue after acute COVID-19 disease (4–12 weeks),[4] while the term post-COVID-19 condition (PCC) refers to signs and symptoms that develop during or after COVID-19 disease that continue for more than 12 weeks and cannot be explained by an alternative diagnosis.[4] As the number of COVID-19 cases and survivors grows, the burden of PCC will also increase. Understanding the epidemiology and associated factors for PCC across diverse populations is crucial as the world transitions from the acute phase of the pandemic to a longer-term chronic phase.

In *The Lancet Global Health*, Murray Dryden and colleagues prospectively investigate the prevalence and risk factors associated with PCC among individuals admitted to hospital with laboratory-confirmed SARS-CoV-2 infection in South Africa.[5] Participants aged 18 years or older were followed up by telephone at 1 month and 3 months after hospital discharge and assessed with use of a standardised questionnaire for the evaluation of symptoms, functional status, health-related quality of life, and occupational status. Of the 3094 participants who were selected and contacted for enrolment, 2410 (77·9%) consented to participate in the study at 1 month after discharge and of these, 1873 (77·7%) completed the 3-month follow-up. Dryden and colleagues' study validates and adds to the literature on PCC and persisting COVID-19-related signs and symptoms globally. More so, because of the dearth of literature in the African region,[3,6] the study adds valuable knowledge by using a relatively large database to provide information on PCC in the region. Furthermore, considering the potential for phenotypic and genetic effects on the characteristics of COVID-19 disease, the racially and ethnically diverse population in South Africa expounds our understanding of PCC in this unique setting. Dryden and colleagues report a prevalence of 82·1% for long COVID and 66·7% for PCC in South Africa. The most common PCC symptoms were fatigue (50·3%) and shortness of breath (23·4%). Additionally, being female and being admitted to an intensive care unit (ICU) were associated with a higher likelihood of PCC signs and symptoms. Furthermore, individuals aged 40–64 years (compared with those younger than 40 years) had increased odds of new or worse disability.

Within the context of current research, Dryden and colleagues validate previous findings about PCC within and outside the African region.[6,7] The study findings also provide additional considerations for practice. For example, findings centred on the effect of PCC on different health domains such as functionality, health-related quality of life, and occupational status showed the need for a multifaceted approach to management. This approach should include managing the physical, mental, and cognitive effects of PCC in individuals. Additionally, several recommendations, such as the Stanford Hall Consensus statement,[8] provide examples of rehabilitation approaches in multidisciplinary domains for individuals with PCC that can be modified on the basis of the specificities of local health settings.

Other findings in Dryden and colleagues' study[5] that provide important considerations for health systems include the relatively high proportion (44·7%) of individuals with PCC who consulted with a general practitioner or primary health-care clinic. This finding suggests the need for the inclusion of primary health-care clinics in implementing PCC interventions. More so, over half of individuals in the study were employed full-time before developing COVID-19 and, among some who

developed PCC, the condition altered their employment status. The effect on employment indicates the potential impact that PCC can have on the economy if timely interventions are not designed and implemented.

Despite these findings by Dryden and colleagues, several questions remain unanswered. For example, the mechanism of PCC and persisting symptoms in individuals who had COVID-19 remains unknown. For instance, what pathophysiological mechanism drives this pathway in individuals who were admitted to ICU and ultimately developed PCC? Is it attributed to ICU-related post-traumatic stress or post-intensive care syndrome,[9] the pulmonary injury from COVID-19, or a combination of both factors? Additionally, can the pattern of multiorgan symptoms or signs (ie, fatigue and shortness of breath) be explained by a resolving or different inflammation, persistent subacute SARS-CoV-2 infection, or a consequence of immunomodulatory therapy? Furthermore, the trajectory of PCC is not fully understood, as most studies have not assessed the condition for up to 12 months.[7] As a step in the right direction, the US National Institutes of Health this year provided nearly US$470 million in funding to the Researching COVID to Enhance Recovery Initiative to help understand the trajectory and clarify the link between COVID-19 and the multiorgan effects of PCC.[10]

Furthermore, no studies have assessed the outcome of multidisciplinary interventions in low-income and middle-income country (LMIC) settings, which account for a large proportion of COVID-19 cases globally. Identifying cost-effective and evidence-based multidisciplinary interventions is especially crucial for the sub-Saharan Africa region because of the limited capital and human resources available. Also, this region's relatively high prevalence of infectious diseases and malnutrition (competing for limited resources in the health system) suggests that interventions in high-income settings might not be readily applicable in LMIC settings. Another overarching question is how clinicians and researchers can work across disciplines and effectively communicate to address cross-disciplinary approaches to managing PCC. How can we design studies using a standardised approach across diverse settings with unequal health-care resources and access to measure the outcome of PCC interventions at the population level?

The key findings from Dryden and colleagues' study are twofold. First, two-thirds of individuals who had COVID-19 in their cohort reported PCC symptoms that affected their functional status, quality of life, and occupational status. Second, women and individuals admitted to ICU had an increased likelihood of reporting PCC. Findings from this study indicate the urgent need for research clarifying the link between COVID-19 status and persisting or new multiorgan PCC signs or symptoms, as well as the need for concerted efforts to develop an evidence-based multidisciplinary management strategy for individuals affected by the condition.

I declare no competing interests.

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1 Center for Systems Science and Engineering at Johns Hopkins University. COVID-19 dashboard. https://coronavirus.jhu.edu/map.html (accessed July 10, 2022).
2 WHO Regional Office for Africa. COVID-19 (WHO African region). https://who.maps.arcgis.com/apps/opsdashboard/index.html#/0c9b3a8b68d0437a8cf28581e9c063a9 (accessed July 10, 2022).
3 Jin H, Lu L, Fan H. Global trends and research hotspots in long COVID: a bibliometric analysis. *Int J Environ Res Public Health* 2022; **19:** 3742.
4 NICE. COVID-19 rapid guideline: managing the long-term effects of COVID-19. https://www.nice.org.uk/guidance/ng188 (accessed July 10, 2022).
5 Dryden M, Mudara C, Vika C, et al. Post-COVID-19 condition 3 months after hospitalisation with SARS-CoV-2 in South Africa: a prospective cohort study. *Lancet Glob Health* 2022; **10:** e1247–56.
6 Osikomaiya B, Erinoso O, Wright KO, et al. 'Long COVID': persistent COVID-19 symptoms in survivors managed in Lagos State, Nigeria. *BMC Infect Dis* 2021; **21:** 304.
7 Lopez-Leon S, Wegman-Ostrosky T, Perelman C, et al. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. *Sci Rep* 2021; **11:** 16144.
8 Barker-Davies RM, O'Sullivan O, Senaratne KPP, et al. The Stanford Hall consensus statement for post-COVID-19 rehabilitation. *Br J Sports Med* 2020; **54:** 949–59.
9 Kaseda ET, Levine AJ. Post-traumatic stress disorder: a differential diagnostic consideration for COVID-19 survivors. *Clin Neuropsychol* 2020; **34:** 1498–514.
10 Researching COVID to Enhance Recovery Initiative. Making progress toward recovery. 2022. https://recovercovid.org/research (accessed July 10, 2022).