Long-COVID and Nutrition

In preparation for a novel clinical challenge

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As we enter a phase of the COVID-19 pandemic where, in many regions, the number of those recovering from COVID-19 has eclipsed the number of those being actively treated, we are presented with a new challenge in the shape of 'Long COVID'. There are established links between good nutritional status and a functioning immune system, which have been examined previously in the context of the pandemic.[1, 2] Here we discuss how poor nutritional status may have contributed to the ill-effects of the pandemic, but also how the pandemic may have a longer-term effect on nutritional status for the population at large. The two can also overlap in a vicious cycle.

Mortality from COVID-19 has been highest among older people and those with comorbidities, many of whom are also at high risk of malnutrition.[3] Malnutrition - undernutrition and/or obesity both with possible micronutrient deficiencies - often develops in the community and is associated with worse clinical outcomes in infectious diseases as fundamental immune functions rely upon adequate nutritional status.[1] Being overweight or having obesity, and related metabolic diseases are consistently associated with poorer outcomes from COVID-19.[4-6] Considering that approximately 29% of adults admitted to UK hospitals already have malnutrition, and more than 60% of adults in England are overweight or obese, as well as, the hidden prevalence of micronutrient deficiencies, it is likely that all forms of malnutrition have contributed to overall mortality, and morbidity, during the pandemic.[7, 8]

Furthermore, many people discharged from hospital are likely to have, or be at high risk of, malnutrition because of several factors including the effects of acute illness, and inadequate nutritional screening and intervention during their hospital admission.

Most of the existing literature on nutrition in COVID-19 has focused on nutritional risk factors in relation to acute disease severity and outcomes. For example, our group recently examined this in patients with COVID-19 in an intensive care unit (ICU).[9, 10] In general, higher BMI, poorer metabolic health, and micronutrient deficiencies have been associated with worse outcomes in this setting. However, these do not necessarily represent the major nutritional risk factors for all people who requiring inpatient care for COVID-19, particularly those who are elderly, frail, and primarily treated on general wards. A review of more than 10,000 geriatric patients from Sweden found that being underweight and malnurished (determined by low Mini Nutrition Assessment – short form score) were significant risk factors for death from COVID-19, and other causes, but being overweight and obese were not.[11] This demonstrates how different forms of malnutrition can pose a greater risk from COVID-19 to different individuals in different settings.

On hospital wards, during the pandemic, the barriers to routine nutrition screening, food provision and intake, have included increased patient load, understaffing pressures, and direct effects of COVID-19, as outlined in **Table 1**.[12]

Long COVID broadly describes the phenomenon of persistent symptoms, for weeks and months, after the acute phase of COVID-19 infection. Currently, formal terminology, definitions and usage differ, for example, the NICE guideline scope uses 'post-COVID-19 syndrome' defined as symptoms persisting beyond 12 weeks of onset while the ongoing ONS survey uses 'Long COVID' to describe persistent symptoms beyond four weeks.[13, 14] Nonetheless, the number of people affected by Long COVID is significant. As of 4 July 2021, an estimated 945,000 people in the UK self-reported Long COVID, with 65% of those adversely affected in daily activities.[14]

As described in two seminal reviews, Long COVID can affect multiple organ systems. Loss of taste and smell can persist in approximately 10% of patients at up to six months follow-up, persistent gastrointestinal symptoms have been reported in up to 31% of patients, and up to 8% report persistent issues with speech and swallowing.[15, 16] One COVID-19 follow up study reported weight loss in 16% of patients two months after non-critical cases.[17]

Despite this, there appears to be very little consideration for role of, and impact on, nutritional status in COVID-19 recovery and Long COVID in the emerging literature. Interrogation of the supplementary material from the COMEBAC study report showed that their four-month post-COVID telephone questionnaire included questions about weight loss, appetite, and ability to prepare and consume meals.[18]

Some 9.1% of patients self-reported weight loss of more than 5% baseline body weight (reported in supplementary file) but the results of the other questions are unreported and weight measurements were not included in their ambulatory physical assessment.[18] In other studies examining multi-disciplinary rehabilitation for COVID-19 patients, nutrition counselling is either mentioned in the treatment protocol but not reported, or not mentioned.[19, 20]

Where nutrition has been considered at follow up, it has largely been in the post-ICU population, and has highlighted significant cause for concern. An observational study of nutritional status of inpatients after an admission to ICU found that 14.6% of patients were suffering from undernutrition, 65.9% were at risk of undernutrition and 61% had experienced some degree of weight loss.[25] In a Spanish study of patients who required artificial nutrition support, 100% were at risk malnutrition by Subjective Global Assessment, while 87.1% were at risk of sarcopenia on discharge.[26] Importantly, when the risk of dysphagia or malnutrition were detected, nutritional counselling was provided. After six months, 1.7% of patients remained at risk of malnutrition, but 49.2% at risk of sarcopenia. This lasting sarcopenia risk is particularly concerning given the high prevalence of obesity and metabolic dysfunction in this cohort.

In several ongoing prospective cohort studies, nutrition outcomes are noticeably absent.[15, 16] Looking further, among the protocols registered for ongoing trials investigating Long COVID and recovery, a clear lack of nutrition-related outcomes is evident.[21-24] Given the fundamental relationship between nutritional status and COVID-19 risk and recovery, the omission of even the most basic nutritional status screening (which may be easily carried out remotely) from these studies would represent major missed opportunities. A limited number of trials have been registered (ACTRN12620000602921; NCT04466800; NCT04451694) and we anticipate that the outcomes of these may illuminate the vulnerability of these population groups following infection.

Consensus nutrition guidelines for COVID-19 recovery and rehabilitation in the community have recently been published.[28] These provide a scoping review of existing nutrition support guidelines from global nutrition bodies, which are in circulation but do not yet appear to have been considered in many trial protocols, or published literature. Some of the key themes from these guidelines are shown in **Table 2**.

There is compelling evidence that nutritional status is a modifiable risk factor in COVID-19 outcomes, and it is likely that ensuring adequate nutrition is fundamental in optimising recovery. COVID-19 can have a profoundly negative effect on an individual's nutritional status, and it is plausible that Long COVID, as a distinct, albeit diverse entity, is associated with further risk of malnutrition in the longer term. There are also parallels from prior learning such as with Chronic Fatigue Syndrome. Therefore, we propose that, as a minimum, nutritional assessments should be included in all clinical and research protocols that follow-up with patients recovering from COVID-19 and/or with Long COVID. Identifying people most at nutritional risk is the first step to improving their nutritional status supporting them. This could include simple strategies such as the use of validated screening tools like MUST, direction toward food-based strategies to combat specific symptoms (fatigue, breathlessness, loss of taste or smell), or recovery/maintenance of body mass and where significant risk is identified, referral to a registered dietitian or a nutrition support MDT. Resources already exist to guide patients based on their level of risk.[29]

Crucially, nutritional status can be considered as a modifiable risk factor at both ends of this scale. To promote optimal recovery from illness and build a more resilient population for future health challenges and pandemics, a focus on nutrition increasingly is paramount importance.

Table 1: Barriers to Optimising Nutrition Support on COVID-19 Wards

Staff pressures:
- incomplete food record charts,
- insufficient support at mealtimes,
- redeployment of staff unfamiliar with ward-based nutrition care,
- less recognition of patient's struggling to eat.

Effects of illness:
- difficulty breathing and requirement for supplemental oxygen,
- loss of appetite, taste and/or smell,
- frailty,
- gastrointestinal symptoms,
- cognitive disturbances – including low mood and delirium,
- dysphagia following ICU stay.

Difficulties with food provision:
- staff sickness,
- requirement for personal protective equipment and safe working environments,
- disruption to supply chain and logistics.

Table 2: Consensus Nutrition Guidelines in COVID Recovery[30]

- Screening for malnutrition, which can be achieved by remote consultation.
- Care plans with appropriate nutrition support, which may include food-based strategies, oral nutritional supplements and referral to a dietitian.
- Continuity of nutritional care between settings including rapid communication at discharge of malnutrition risk and requirements for ongoing nutrition support.

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