The prevalence and location of musculoskeletal pain following COVID-19

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1 | INTRODUCTION

Widespread muscle and joint pain has emerged as one of the primary post-infection symptoms of the SARS-CoV-2 virus (COVID-19). Of individuals discharged from hospital, 57.2\% report persistent musculoskeletal pain after 6 months (Evans et al., 2021). Despite this astounding prevalence, the anatomical locations of these complaints remain largely underreported. In addition to chronic pain, fatigue is also amongst the most commonly reported symptoms (Evans et al., 2021; Mandal et al., 2021; Shang et al., 2021), which, without intervention, may lead to a cycle of inactivity and further pain. With recent data indicating that 25\% of those hospitalised with COVID-19 require rehabilitation (Daynes et al., 2021), establishing the extent of these symptoms will be crucial to enabling the delivery of effective post-infection care.

The 2017 Health Survey for England estimated the prevalence of chronic pain to be 34\% for the UK general population (Public Health England, 2020). These normative data allow us to compare pain prevalence amongst individuals suffering with long COVID (defined as signs and symptoms that continue or develop after acute COVID-19 [National Institute for Health and Care Excellence, 2020]) in the absence of a previous pain score. Early data suggests that the prevalence of chronic pain is likely to be significantly greater amongst those suffering with long COVID compared with the general population (Evans et al., 2021; Karaarslan et al., 2021). In a 1 month follow-up of 300 individuals hospitalised with COVID, Karaarslan and colleagues identified a 56.3\% prevalence of prolonged musculoskeletal symptoms such as back pain and myalgia. Research identifying the common sites of these symptoms is now needed to understand the scope of the issue and enable the development of targeted rehabilitation strategies.

Current NICE guidelines for those suffering with chronic pain encourage individuals to remain engaged in regular physical activity, preferably via a supervised group exercise programme (National Institute for Health and Care Excellence, 2021). This is also consistent with current musculoskeletal rehabilitation practice in primary care, where physical activity is regularly promoted (Booth et al., 2017). Establishing the frequency and locations of musculoskeletal pain in this population, as well as understanding the factors that may increase an individual’s susceptibility, will be necessary to effectively tailor these physical activity programmes to long-COVID individuals.

The primary aim of this study was to identify the prevalence and location of musculoskeletal pain in individuals following discharge for COVID-19. In addition, associations between pain prevalence and fatigue levels, physical activity, ventilation status, length of hospital stay and individual demographics were analysed.

2 | METHODS

This was a prospective observational cohort study of individuals discharged from hospital following admission for COVID-19. All those discharged from the University Hospitals of Leicester (UHL) between April 2020 and December 2020 were eligible for the study. Participants were contacted by telephone following hospital discharge to discuss their symptoms as part of routine clinical care and were excluded from the analysis if they did not provide consent for their data to be used. Those admitted with an incidental positive
COVID-19 test where COVID-19 was not the primary cause for admission were excluded. Medical history and baseline demographic information was taken from hospital discharge letters and confirmed during the telephone assessment. During the assessment, pain prevalence, location and nature of the pain was explored. Pain location was recorded using a body chart and was categorised into either lower limb, upper limb, lumbar, thoracic and cervical spine, or no location specified. Where two or more independent pain sites were mentioned, pain was categorised as multisite. Where nonspecific terminology was used by participants such as ‘general muscle aches’ or ‘pain everywhere’, pain was categorised as ‘no location specified’. Categorisation of pain was determined from the participant’s description by the researcher performing the analysis. Where distinction between musculoskeletal and other pain could not be accurately deciphered, participants were excluded from the analysis. This included complaints of pain associated with shortness of breath/respiration and head pain.

In addition to pain sensation and location, further information recorded included participants’ level of fatigue identified using a 0–10 verbal analogue scale, physical activity level categorised by either ‘currently exercising’, ‘exercised prior to COVID but not currently’ or ‘no previous exercise’ and a verbally completed Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). If participants required a referral to musculoskeletal physiotherapy services, this was recorded. Data was analysed using IBM SPSS Statistics for Windows, Version 26.0. Participant characteristics were analysed and are displayed as a mean and standard deviation. Binary logistic regression was performed to analyse the effects of length of hospital stay, fatigue score, age, Body Mass Index (BMI), gender, HADS, prone positioning, ventilation status and physical activity status on the likelihood that individuals reported pain. A One-Way ANOVA was performed to identify associations between pain location and length of hospital stay, fatigue score, age, BMI and HADS. Researchers completing data analysis were independent from those conducting follow-up phone calls.

3 RESULTS

763 individuals completed a post discharge telephone call. 372 individuals provided consent for their data to be included in the analysis. Of the consenting group, 331 gave an indication of their pain status and were included in the analysis. The mean (±SD) time to phone call post discharge was 45 (±29) days (n = 309). 183 (59%) of participants were male with a mean (±SD) age of 58 (±15) years, and length of hospital stay of 9 (±14) days (n = 328). 166 (50.15%) participants reported musculoskeletal pain in at least one area of the body. The distribution of musculoskeletal pain, as shown in Figure 1.

![Diagram showing distribution of musculoskeletal pain](image-url)

**Figure 1** Diagram showing distribution of musculoskeletal pain. Figure shows the distribution of reported musculoskeletal pain in 166 individuals (%). Upper and lower limbs are divided into more specific locations based on descriptions provided. Non-specific and multisite pain is also illustrated.
was; lower limb 27% (n = 45), lumbar spine 19% (n = 32), no location specified 17% (n = 29), multi-site 13% (n = 22), upper limb 13% (n = 21), thoracic spine 7% (n = 11), neck 4% (n = 6). There were no significant associations between pain location and any of the variables recorded.

Mechanical ventilation status was available for 187 individuals. Of this population, 30 (16.04%) participants required mechanical ventilation. Musculoskeletal pain was not associated with length of hospital stay (n = 328, odds ratio [OR] with 95% confidence interval: 1.03, 1–1.05, p = 0.021) but was associated with ventilation status (n = 187, OR: 3.16, 1.33–7.54, p = 0.009). There was no significant difference in prone positioning, age, sex or BMI between those with and without pain. There was no significant difference in length of time between discharge and telephone assessment between groups.

A fatigue score (0–10) was collected for 314 participants. Of this group, 45 (14.33%) individuals reported an absence of fatigue (VAS = 0). Of the remaining 269 participants reporting fatigue, the mean (±SD) fatigue VAS score was 5.42 (±2.25). Fatigue score was associated with a greater likelihood of musculoskeletal pain (OR: 1.16, 1.07–1.26 [p < 0.001]). Physical activity status was available for 269 individuals. 102 (37.92%) self-reported that they were physically active, 100 (37.17%) as having exercised prior to COVID but not currently and 67 (24.91%) as having no previous exercise experience. As shown in Figure 2, the majority of those that were physically active did not suffer with musculoskeletal pain, whilst the inverse was true for individuals that had no previous exercise experience. However, this result is insignificant (p = 0.148).

4 DISCUSSION

These data reveal a higher prevalence of musculoskeletal pain in COVID-19 individuals following discharge from hospital when compared with the national average of 34% (Booth et al., 2017). Prevalence of pain did not differ between age, sex, or BMI. The most commonly affected areas were the lower limbs and lumbar spine, with a large proportion of individuals also reporting non-specific musculoskeletal pain. Mechanical ventilation was significantly associated with pain, however, due to the wide confidence interval likely caused by the limited sample size for this variable, conformation of this would be required from larger data sets to draw any conclusions. Should this be replicated, it may indicate that those requiring mechanical ventilation during their period in hospital may need to be prioritised for initial screening for referral to specialist services to support pain management. There was no association between pain and those who had been prone, this data was only available for a relatively small sample of 55 out of 331 participants so may not have been representative.

This study found that individuals experiencing pain were also significantly more likely to be suffering from greater fatigue levels, which, without intervention, may lead to a cycle of inactivity and further pain. This is a symptom that has substantial implications for exercise-based rehabilitation programmes and will need to be managed carefully. In addition, we found musculoskeletal pain to be most prevalent in the lower limbs, meaning both resistance and cardiovascular-based exercises may need to be adapted to accommodate some individuals.

![Figure 2](image-url)  
**Figure 2** Self-reported physical activity level at follow-up and musculoskeletal pain prevalence. Figure demonstrates the difference in self-reported physical activity level at follow-up (45 ± 29 days post-hospitalisation) of 309 individuals. Physical activity was reported as either currently active, previously active prior to COVID but not currently, or never active. Prevalence of pain is illustrated for each level of physical activity.
Data from other studies identifying the anatomical location of musculoskeletal pain amongst COVID-19 survivors is scarcely available, with the majority of reports focusing more broadly on a range of symptoms such as breathlessness, psychological distress and deteriorating functional capacity. A similar 1-month post-discharge follow-up of COVID-19 sufferers found that 56.3% were experiencing musculoskeletal symptoms (Karaarslan et al., 2021) which closely matches the 50.15% found in our study. Karaarslan and colleagues also found no association between length of hospital stay and prevalence of pain. It should be noted that our study specifically reported musculoskeletal pain, whereas others may broaden this to any musculoskeletal symptoms—incorporating fatigue. In addition, previous pain history was not collected from participants, so it is unclear how many individuals were experiencing new pain, or a potential worsening of existing pain.

The prospective observational nature of this study meant that several limitations were present. The data collected was self-reported via telephone to a healthcare professional, information that was later coded for analysis by one of the research team. Although every effort was made to standardise this process, the descriptive nature of the data meant that coding required some degree of clinical judgement. Ideally, participants would have been contacted at hospitalisation, and then at regular intervals to track symptom progression. However, due to staffing and time constraints, this was not possible.

It is clear from this and other early data that musculoskeletal pain is a significant, lasting symptom of COVID-19 and may occur irrespective of age, sex, or BMI. This data helps inform rehabilitation strategies for those hospitalised for COVID-19, with a particular emphasis on those who experienced a greater initial severity of illness. With multiple symptoms requiring simultaneous management, a multi-disciplinary approach to rehabilitation is warranted. The presence and management of widespread musculoskeletal pain should be considered following discharge for COVID-19 and individuals should also be supported in accessing healthcare services to help manage their pain.

AUTHOR CONTRIBUTION

George Mills completed data analysis and prepared the manuscript. Samuel Briggs-Price, Enya Daynes, Linzy Houchen-Wolloff and Sally Singh made significant contributions to analysis and manuscript development. Samuel Briggs-Price, Enya Daynes and Linzy Houchen-Wolloff contributed to data collection. All authors reviewed and approved the final manuscript.

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CONFLICT OF INTEREST

None declared.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, George Mills, upon reasonable request.

ETHICS STATEMENT

Hereby, I George Mills consciously assure that for the manuscript ‘The Prevalence and Location of Musculoskeletal Pain Following COVID-19’ the following is fulfilled:

This material is the authors’ own original work, which has not been previously published elsewhere.
The paper is not currently being considered for publication elsewhere.
The paper reflects the authors’ own research and analysis in a truthful and complete manner.
The paper properly credits the meaningful contributions of co-authors and co-researchers.
The results are appropriately placed in the context of prior and existing research.
All sources used are properly disclosed (correct citation).
All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, 1996; the principles of Good Clinical Practice, and the Department of Health Research Governance Framework for Health and Social Care, 2005.

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