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Effects of sleep disturbance on dyspnoea and impaired lung function following hospital admission due to COVID-19 in the UK: a prospective multicentre cohort study



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Summary

Background Sleep disturbance is common following hospital admission both for COVID-19 and other causes. The clinical associations of this for recovery after hospital admission are poorly understood despite sleep disturbance contributing to morbidity in other scenarios. We aimed to investigate the prevalence and nature of sleep disturbance after discharge following hospital admission for COVID-19 and to assess whether this was associated with dyspnoea.

Methods CircCOVID was a prospective multicentre cohort substudy designed to investigate the effects of circadian disruption and sleep disturbance on recovery after COVID-19 in a cohort of participants aged 18 years or older, admitted to hospital for COVID-19 in the UK, and discharged between March, 2020, and October, 2021. Participants were recruited from the Post-hospitalisation COVID-19 study (PHOSP-COVID). Follow-up data were collected at two timepoints: an early time point 2–7 months after hospital discharge and a later time point 10–14 months after hospital discharge. Sleep quality was assessed subjectively using the Pittsburgh Sleep Quality Index questionnaire and a numerical rating scale. Sleep quality was also assessed with an accelerometer worn on the wrist (actigraphy) for 14 days. Participants were also clinically phenotyped, including assessment of symptoms (ie, anxiety [Generalised Anxiety Disorder 7-item scale questionnaire], muscle function [SARC-F questionnaire], dyspnoea [Dyspnoea-12 questionnaire] and measurement of lung function), at the early timepoint after discharge. Actigraphy results were also compared to a matched UK Biobank cohort (non-hospitalised individuals and recently hospitalised individuals). Multivariable linear regression was used to define associations of sleep disturbance with the primary outcome of breathlessness and the other clinical symptoms. PHOSP-COVID is registered on the ISRCTN Registry (ISRCTN10980107).

Findings 2320 of 2468 participants in the PHOSP-COVID study attended an early timepoint research visit a median of 5 months (IQR 4–6) following discharge from 83 hospitals in the UK. Data for sleep quality were assessed by subjective measures (the Pittsburgh Sleep Quality Index questionnaire and the numerical rating scale) for 638 participants at the early time point. Sleep quality was also assessed using device-based measures (actigraphy) a median of 7 months (IQR 5–8 months) after discharge from hospital for 729 participants. After discharge from hospital, the majority (396 [62%] of 638) of participants who had been admitted to hospital for COVID-19 reported poor sleep quality in response to the Pittsburgh Sleep Quality Index questionnaire. A comparable proportion (338 [53%] of 638) of participants felt their sleep quality had deteriorated following discharge after COVID-19 admission, as assessed by the numerical rating scale. Device-based measurements were compared to an age-matched, sex-matched, BMI-matched, and time from discharge-matched UK Biobank cohort who had recently been admitted to hospital. Compared to the recently hospitalised matched UK Biobank cohort, participants in our study slept on average 65 min (95% CI 59 to 71) longer, had a lower sleep regularity index (–19%; 95% CI –20 to –16), and a lower sleep efficiency (3·83 percentage points; 95% CI 3·40 to 4·26). Similar results were obtained when comparisons were made with the non-hospitalised UK Biobank cohort. Overall sleep quality (unadjusted effect estimate 3·94; 95% CI 2·78 to 5·10), deterioration in sleep quality following hospital admission (3·00; 1·82 to 4·28), and sleep regularity (4·38; 2·10 to 6·65) were associated with higher dyspnoea scores. Poor sleep quality, deterioration in sleep quality, and sleep regularity were also associated with impaired lung function, as assessed by forced vital capacity. Depending on the sleep metric, anxiety mediated 18–39% of the effect of sleep disturbance on dyspnoea, while muscle weakness mediated 27–41% of this effect.

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