

Researchers characterize and predict post-acute sequelae of SARS-CoV-2 infection

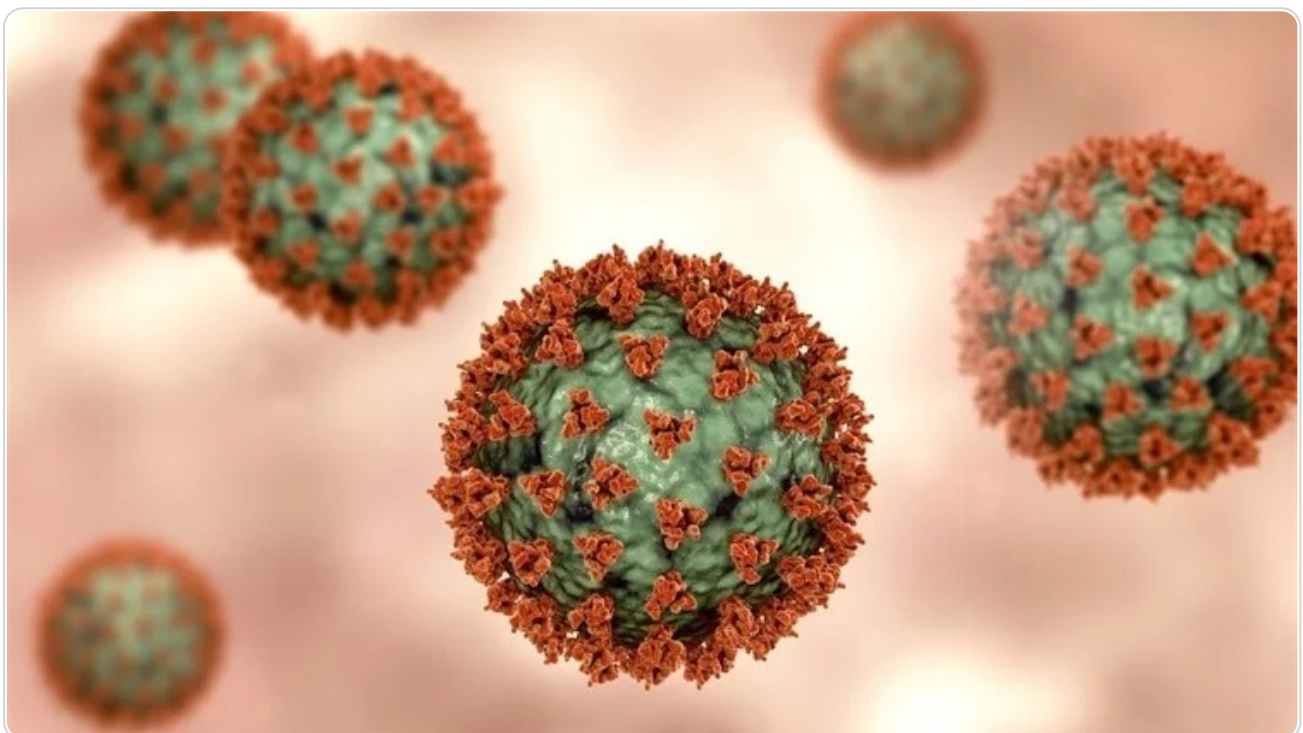


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Oct 25 2022

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In a recent study posted to the [medRxiv](#)* preprint server, researchers characterized and predicted post-acute sequelae of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (PASC) infection.



Study: [Characterizing and Predicting Post-Acute Sequelae of SARS CoV-2 infection \(PASC\) in a Large Academic Medical Center in the US](#). Image Credit:

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Background

The rising number of coronavirus disease 2019 (COVID-19)-recovered persons suffering from post-acute sequelae of SARS-CoV-2 infection (PACS) has become a global concern. However, the development of efficient treatments has been impeded by the novelty of this disease and the scant information available about the underlying pathomechanisms.

About the study

In the present study, researchers described PASC-associated diagnoses and developed models for risk assessment.

The study involved eligible individuals who were patients of Michigan Medicine (MM) and who were diagnosed with COVID-19 or tested positive for real-time reverse transcriptase polymerase chain reaction (RT-PCR) for SARS-CoV-2 infection between 10 March 2020 and 31 August 2022. Data from RT-PCR tests were gathered for employee screening, standard screening at hospital admission, and routine screening before treatments. Symptomatic as well as asymptomatic subjects participated in the study. The index date for each participant was either their initial COVID-19 diagnosis or positive RT-PCR test, whichever was earlier.

The remaining COVID-19-positive patients were further divided into groups: (1) "no PASC" patients who had no recorded PASC diagnosis and (2) patients having a recorded diagnosis of PASC. Diagnoses for PASC were determined using either observation of the ICD10-CM codes B94.8, which indicated sequelae related to other specified infectious and parasitic disorders or U09.9, which indicated unspecified PASC or entries for PASC in the diagnosis component of the Problem Summary List (PSL) of the electronic health records (EHR) database.

Subsequently, the team conducted phenome-wide association studies (PheWASs) to identify enriched phenotypes associated with the post-COVID-19 era and putative PASC predisposing phenotypes related to the pre- and acute-COVID-19 periods.

Additionally, the team divided PASC patients into groups according to ICD10 diagnoses that corresponded to 29 phenotypic concepts that had previously been reported as typical PASC symptoms and that were simultaneously recorded with their initial PASC diagnoses. Furthermore, patient characteristics were assessed and adjusted for socioeconomic status and other factors, including age, gender, race/ethnicity, person-per-square-mile population density, and neighborhood disadvantage index (NDI) without Black community proportion.

Results

A PASC diagnosis was reported by 1,724 of the 63,675 COVID-19 positive patients a minimum of two months following their initial COVID-19 diagnosis or RT-PCR positive result. Within three months of COVID-19 diagnosis, the incidence of clinically confirmed PASC varied between 0.18% to 1.8%. The second peak of COVID-19 positive people at MM coincided with the largest quarterly number of PASC infections recorded in the fourth quarter of 2021.

The team also found that compared to controls, PASC cases had slightly longer periods covered in the pre-test EHRs than controls and had a higher chance of being older, female, and receiving primary care at MM in the previous two years.

Almost 34.3% of individuals reported shortness of breath, 30.6% experienced anxiety, 28.5% had fatigue and malaise, 27.2% had depression, 25.4% suffered from sleep disturbances, 23.6% reported asthma, 21.4% experienced headaches, 13.8% had migraine, 13.0% had a cough, and 12.6% had joint pain. All of the 29 PASC symptoms that were examined were enriched, with 27 of them reaching phenome-wide significance and two did not. PheWAS also suggested the enrichment of several illnesses, including musculoskeletal problems, infectious diseases, as well as digestive disorders.

PheWAS compared 1,212 cases to 11,919 matched controls, utilizing only the diagnoses reported at least two weeks before being COVID-19 positive. This allowed the identification of putative pre-COVID-19 symptoms that predispose COVID-19 diagnoses to PASC. Out of the 1,405 examined PheCodes, phenome-wide relevance was exhibited for irritable bowel syndrome (IBS), nausea and vomiting, concussion, respiratory abnormalities, food allergies, and general circulatory disease.

The frequencies and corresponding signals across the three PheWAS were employed to determine if PASC-associated phenotypes associated with the pre- and acute-COVID-19 periods resulted in novel PASC symptoms or whether they become long-term PASC symptoms by themselves.

Conclusion

Overall, the study demonstrated an agnostic screening of time-stamped EHR

data that revealed a wide range of diagnoses linked with PASC across several categories. The study also noted a complex arrangement of possible predisposing factors which may be used to develop risk stratification strategies. However, extensive research will be required to adequately characterize PASC and its variants, particularly with regard to long-term effects, and to take into account more thorough risk models.

*Important notice

medRxiv publishes preliminary scientific reports that are not peer-reviewed and, therefore, should not be regarded as conclusive, guide clinical practice/health-related behavior, or treated as established information.

Journal reference:

- Characterizing and Predicting Post-Acute Sequelae of SARS CoV-2 infection (PASC) in a Large Academic Medical Center in the US. Lars G Fritsche, Weijia Jin, Andrew J Admon, Bhramar Mukherjee. *medRxiv*. doi: <https://doi.org/10.1101/2022.10.21.22281356>
<https://www.medrxiv.org/content/10.1101/2022.10.21.22281356v1>



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Bhavana Kunkaliker is a medical writer based in Goa, India. Her academic background is in Pharmaceutical sciences and she holds a Bachelor's degree in Pharmacy. Her educational background allowed her to foster an interest in anatomical and physiological sciences. Her college project work based on 'The manifestations and causes of sickle cell anemia' formed the stepping stone to a life-long fascination with human pathophysiology.