Seasonality of Coronavirus 229E, HKU1, NL63, and OC43 From 2014 to 2020

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Abstract

The possibility of seasonality of COVID-19 is being discussed; we show clinical microbiology laboratory data illustrating seasonality of coronaviruses 229E, HKU1, NL63, and OC43. The data shown are specific to the 4 studied coronaviruses and may or may not generalize to COVID-19.

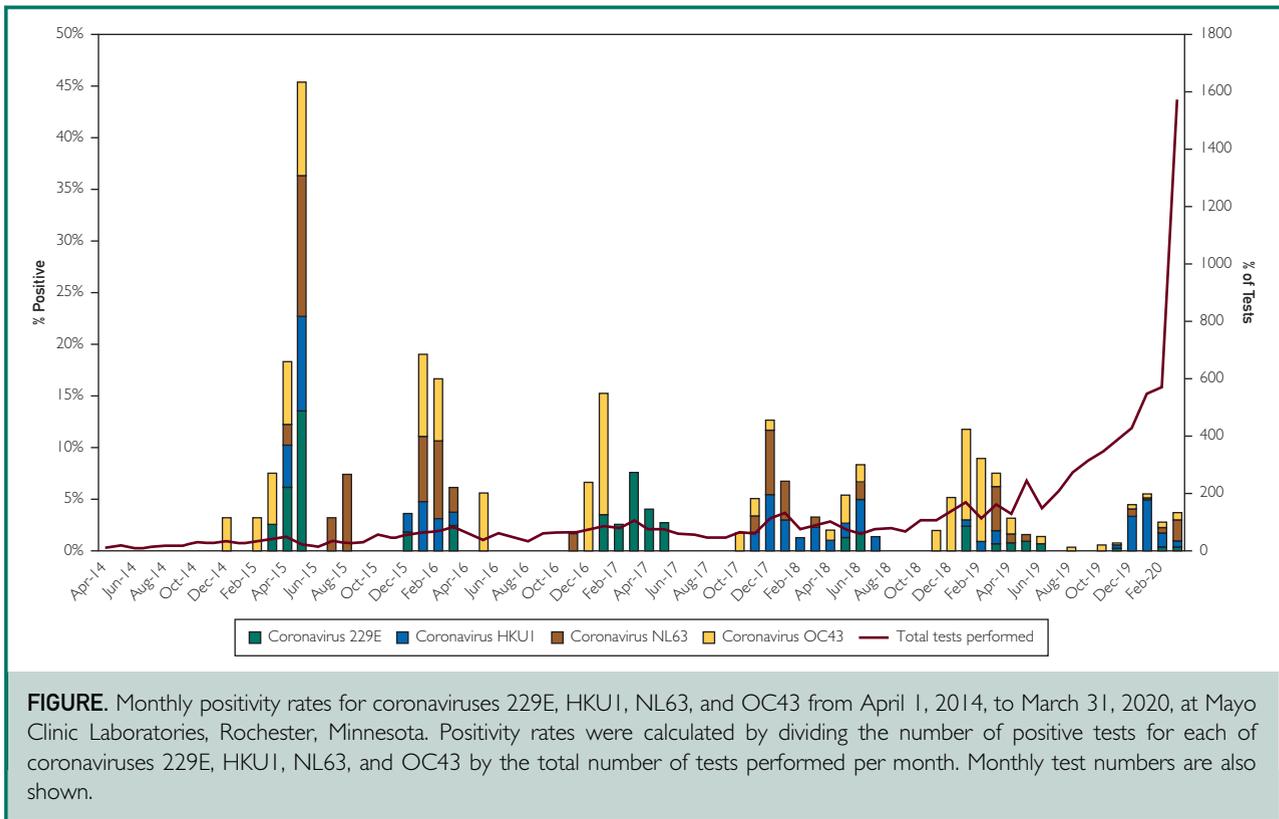© 2020 Mayo Foundation for Medical Education and Research ■ Mayo Clin Proc. 2020;95(8):1701-1703

There is speculation about the possible seasonality of COVID-19; although multiyear data are not available for this coronavirus, United States Food and Drug Administration approved/cleared multiplex respiratory panels have been available for testing for coronaviruses 229E, HKU1, NL63, and OC43 for almost a decade.[1] Our group has described the use of high-volume clinical microbiology laboratory data to visualize seasonality of infectious agents including *Bordetella pertussis*[2] and *Legionella* species.[3] Here, data collected from results of the BioFire, FilmArray, respiratory (RP) panel (BioFire Diagnostics, Salt Lake City, Utah) performed at Mayo Clinic Laboratories (Rochester, Minnesota) on nasopharyngeal swabs, bronchoalveolar lavage fluid, or bronchial washings, between April 1, 2014, and March 31, 2020, were analyzed to assess seasonality of coronaviruses 229E, HKU1, NL63, and OC43. Over this period, 8839 tests (mean: 123 per month; range: 8 to 1570 per month) were performed (Figure); 3234 (37%) results were positive for at least 1 target on the panel. Three hundred and twenty-six (4% overall) were positive for coronavirus 229E (n=47), HKU1 (n=95), NL63 (n=81), or OC43 (n=103). Seasonality was observed for all 4 coronaviruses, with the lowest detection rates in summer and early fall and the highest rates in winter and early spring (Figure). Of note, no cases of coronavirus HKU1, and a single case of coronavirus NL63, occurred in the winter of 2016 to 2017.

Our findings are similar to those reported from the Karolinska Institutet (Sweden), although different assays were used in the Swedish study compared with ours, and one of their assays (Allplex Respiratory Panels, Seegene Technologies, Seoul, South Korea) did not differentiate between coronavirus HKU1 and OC43.[4] Al-Khannaq et al studied coronaviruses NL63 and 229E in Kuala Lumpur, Malaysia, between 2012 and 2013, showing a peak in coronavirus NL63 infections between June and October 2012, with no significant peak throughout the year for coronavirus 229E.[5] Friedman et al studied coronaviruses 229E, NL63, OC43, and HKU1 in Israel during 2015 to 2016, showing the first 3 to be most common in winter, with HKU1 being most common in spring and summer.[6] Galanti et al sampled 214 persons in New York City, with weekly nasal swabs from 2016 to 2018, to investigate the prevalence of respiratory viruses; coronaviruses were most commonly detected in winter months, although no breakdown by coronavirus serotype was provided.[7] Goés et al tested for coronaviruses 229E, NL63, OC43, and HKU1 in 282 children with acute respiratory tract infection in a Brazilian slum during 2005 to 2006 and showed coronavirus detection to be most common in winter.[8] Huang et al studied coronavirus NL63 in hospitalized patients with pneumonia and outpatients

FIGURE. Monthly positivity rates for coronaviruses 229E, HKU1, NL63, and OC43 from April 1, 2014, to March 31, 2020, at Mayo Clinic Laboratories, Rochester, Minnesota. Positivity rates were calculated by dividing the number of positive tests for each of coronaviruses 229E, HKU1, NL63, and OC43 by the total number of tests performed per month. Monthly test numbers are also shown.

with influenza-like illness in Taiwan from 2010 to 2011 and observed a peak prevalence in late winter.[9] Killerby et al described coronavirus OC43, 229E, NL63, and HKU1 reported to The National Respiratory and Enteric Virus Surveillance System by United States laboratories from 2014 through 2017; overall, 2.2%, 1.0%, 0.8%, and 0.6% results were positive for coronavirus OC43, NL63, 229E, and HKU1, respectively, with positive tests peaking during December through March.[10] Finally, our data are in agreement with those available from BioFire, found at https://syndromictrends.com/.

There are several possible explanations for seasonality of coronavirus OC43, NL63, 229E, and HKU1, including temperature, humidity, and human behavior changes. Coronaviruses are heat sensitive, with SARS-CoV-2, for example, having been shown to survive longer at 4°C than 22°C and at 22°C than 37°C.[11] Low humidity can dry mucosal membranes and have a negative impact on ciliary function of the mucosal epithelium, increasing susceptibility to infection with some respiratory viruses; low humidity can also result in delayed settling of respiratory droplets. Human behavioral changes include indoor crowding with cooler temperatures.

Although our data are specific to coronaviruses 229E, HKU1, NL63, and OC43, they may be helpful in understanding seasonality of COVID-19, which some have proposed may become milder in the summer months.[4] As the 4 coronaviruses studied are genetically more similar to one another than to SARS-CoV-2, and studies on seasonality of Middle East respiratory syndrome virus have reported variable results,[12-14] we caution that our findings may not generalize to non-OC43, NL63, 229E, and HKU1 coronaviruses, including SARS-CoV-2.

CONCLUSION

Clinical microbiology laboratory data collected over a 6-year period illustrate seasonality of coronaviruses 229E, HKU1, NL63, and OC43, with the lowest detection rates in summer and early fall and the highest rates in winter and early spring.

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