Epidemiology and clinical presentations of the four human coronaviruses 229E, HKU1, NL63, and OC43 detected over 10 years among different Brazilian populations

Authors: Cabeça, T.K; Granato, C.F.H; Bellei, N

Affiliations: ‘Clinical Virology Laboratory, Discipline of Infectious Diseases, Sao Paulo Federal University, Sao Paulo, SP, Brazil

Abstract:

Background:
Four human coronaviruses (HCoV-229E, HCoV-HKU1, HCoV-NL63, and HCoV-OC43) are known to circulate worldwide and are associated with a range of respiratory outcomes. There are few epidemiological and clinical studies concerning HCoV, mainly in South America, and they are often restricted to one or two groups of patients.

Objectives:
Our study aimed to investigate retrospectively the presence of HCoVs in 4 different patients groups of Sao Paulo, Brazil from 2001 to 2010.

Methods:
Subjects were 1,137 patients, 50 asymptomatic and 1,087 presenting acute respiratory infections: 465 patients from community (adults, children and healthcare workers), 410 at-risk patients (renal transplanted patients, children with heart diseases and bone marrow transplanted patients) and 212 hospitalized patients (adults and children). To identify the HCoVs in respiratory samples (nasopharyngeal swabs, nasal aspirations or nasal lavages), a pancoronavirus RT-PCR screening assay was first performed and in a second step, species-specific real-time RT-PCR monoplex assays.

Results:
Pancoronavirus screening assay detected 123/1,137 (10.8%) coronaviruses in all studied groups and species-specific real-time assays confirmed 62/1,137 (5.4%) of positive samples. Discrepancy among methods will be further investigated by sequencing, since it may be a new HCoV species. Of the 62 positive samples, 14 (22.5%) were OC43, 9 (14.5%) were 229E, 34 (54.8%) were NL63 and 5 (8.0%) were HKU1. Coronaviruses were detected in every month except in December (summer) with displayed marked winter seasonality (45.1%). Peaks detection frequency was observed during 2001-2002, 2004-2005 and...
2008-2009, with the highest detection in 2008. There were additional longer-term differences in detection frequencies between seasons, with HCoV-229E predominant in 2004 and HCoV-NL63 dominating in the 2008. Coronaviruses-positive cases were found from patients ranging in age from 4 months to 68 years, with a median age of 34 years. The majority (67.7%) was female. The prevalence of HCoVs was higher among at-risk patients (8.0%) than other groups of patients. Children with heart diseases presented higher prevalence (14.8%) and the highest risk of acquiring coronavirus infection when compared with the other populations by logistic regression analysis. (OR = 7.2; 95% CI 2.4–21.1). Healthcare workers also presented a high rate of coronavirus-infected cases (10.4%). No differences on clinical expressions were obtained between the studied groups considering those coronavirus-infected patients (p=>0.05). The most common symptoms were coriza (87.0%), cough (72.5%) and fever (51.6%). Lower respiratory tract infection was documented in 4/5 (80%) of hospitalized coronavirus cases and one of them died of HCoV-NL63 associated with pneumonia.

Conclusions:
HCoVs can cause more than the common cold and mild respiratory tract disease and they may play a significant role in children with heart diseases and healthcare workers which can be susceptible groups to develop respiratory tract infection by HCoVs. The HCoV species NL63 may represents an important pathogen involved in unexplained respiratory illnesses.