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Incidence of Seasonal Coronaviruses and Post-infection Antibody Responses in Older Adults Between 2015 to 2017 in Southeastern China

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Background

The incidence of seasonal coronaviruses (HCoV-OC43, HCoV-HKU1, HCoV-229E, HCoV-NL63) and its post-infection antibody response among older adults are not well understood.

Objectives

To determine the incidence of seasonal coronavirus infection, symptom profiles and its association with antibody responses, in older adults in South-eastern China.

Methods

The study was based on the China Ageing Respiratory infection study (CARES) conducted between 2015 to 2017 in Yancheng and Suzhou in Jiangsu Province, China. The study recruited individuals 60-89 years-of-age that were monitored for respiratory viral infections.



Fig 2. Seasonal CoV infection significantly boosted specific IgG four months post infection. (a-d) IgG antibody titers in seasonal coronavirus infection cases at pre-

Serum samples were collected every six months for two years. A total of 844 nasal swab samples were collected from individuals who reported acute respiratory symptoms and tested by qRT-PCR for HCoV-OC43, HCoV-HKU1, HCoV-229E, and HCoV-NL63. We then tested the longitudinal serum samples from 63 PCR(+) patients, and 10 PCR(-) controls for the seasonal coronavirus and SARS-CoV-2 S and N proteins by ELISA.

Results

Table 1. Characteristics of self-reported ILI cases in total and stratified by study sites and distribution of seasonal coronavirus infection in CARES cohort.

	Total	Yancheng	Suzhou
ILI episodes	N = 844	N = 408	N = 436
HCoV-PCR positive (N, %)			
HCoV-OC43	41 (4.9%)	20 (4.9%)	21 (4.9%)
HCoV-NL63	28 (3.3%)	18 (4.4%)	10 (2.3%)
HCoV-HKU1	22 (2.6%)	9 (2.2%)	13 (3%)
HCoV-229E	14 (1.7%)	5 (1.2%)	9 (2.1%)
Total	105 (12.4%)	52 (12.7%)	53 (12.2%)

Fig 1. Seasonal coronavirus infection cases surveillance during the study period in Yancheng (A) and Suzhou (B). Stacked bars indicated the number of PCR(+) cases of each coronavirus infection. Percentage of each seasonal coronavirus infection detected in selfreported respiratory illness cases was indicated with grey line.

Fig 3. Proportion of reported symptoms in PCR-confirmed seasonal coronavirus ARI (**a**) and PCR-negative ARI cases (b). (c) Symptom severity scores for reported symptoms in PCR-confirmed seasonal CoV ARI and PCR-negative ARI cases. (d-h) Correlation between pre-infection IgG titers and systemic scores in seasonal CoV ARI cases.

• Seasonal coronaviruses showed an almost all-year round trend although the epidemic peak was dominant in summer and autumn and did not coincide with peak influenza activity.

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Conclusion

- Over 80% of serum samples were seropositive to at least one antigen for all the seasonal coronaviruses at baseline.
- Seasonal coronaviruses cause less fever and sore throat compared to other respiratory infections with cough and nasal congestions being the most common symptoms.
- Cases with higher pre-infection levels of HCoV-229E S1-IgG and HCoV-NL63 S-IgG experienced less severe systemic symptoms. Older adults with high baseline IgG antibody titers could still be infected. Seroconversion and magnitude of antibody response after infection was modest and dependent on pre-existing titers.

References

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