

Household transmission of SARS-CoV-2 during the Omicron wave in Shanghai, China: a case-ascertained study

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Abstract

Since late 2021, the highly transmissible SARS-CoV-2 Omicron variant has driven a new surge of infections across the world. We used a case-ascertained study to determine the features of household transmission of SARS-CoV-2 Omicron variant in Shanghai, China. We collected detailed information on 323 pediatric cases and their 951 household members, all received consecutively intensive RT-PCR testing. We estimated the transmission parameters. Both secondary infection attack rates (SARI) and secondary clinical attack rates (SARC) among adult household contacts were computed, through which the transmission heterogeneities in infectivity and susceptibility were characterized and the vaccine effectiveness were estimated. The mean incubation period and serial interval of Omicron variant were estimated to be 4.6 ± 2.1 days and 3.9 ± 3.7 days. The overall SARI and SARC among adult household contacts were 77.11% (95% confidence interval [CI]: 73.58%-80.63%) and 67.03% (63.09%-70.98%). We found higher household susceptibility in females, while infectivity was not significantly different in primary cases by age, sex, vaccination status and clinical severity. Full vaccination and booster vaccination of inactivated vaccines were 14.8% (5.8%-22.9%) and 18.9% (9.0%-27.7%) effective against Omicron infection and 21.5% (10.4%-31.2%) and 24.3% (12.3%-34.7%) effective against symptomatic disease. Overall, we found high household transmission during the Omicron wave in Shanghai due to asymptomatic and pre-symptomatic transmission in the context of city-wide lockdown, indicating the importance of early detection and timely isolation of SARS-CoV-2 infections and quarantine of close contacts. Marginal effectiveness of inactivated vaccines against Omicron infection poses great challenge for prevention and control of the SARS-CoV-2 Omicron variant.

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