Profile Analysis of SARS-CoV-2 Community Infections During Periods With Omicron BA.2, BA.4/5, and XBB Dominance in Hong Kong: A Prospective Cohort Study

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Background

For seasonal influenza virus infections, such improved understanding based on representative community data has enabled the enhancement of diagnostic accuracy,[1] the assessment of the effect of vaccines,[2] and the estimation of community health-care burdens and productivity loss.3 However, for SARSCoV-2 infection, crucial gaps remain in our understanding of its clinical profile. Although some previous studies have examined common symptoms after infection with omicron (B.1.1.529) BA.2 and BA.4/5 subvariants, they were largely biased towards severe clinical outcomes, such as hospitalisation and mortality in medically attended patients, and were therefore poorly representative of the majority of cases in the general community4,5,8,9 and did not provide a comprehensive reflection of the disease over the whole clinical severity spectrum.

Objectives

We aimed to examine and compare the clinical profile of SARS-CoV-2 across three waves dominated by omicron subvariants BA.2, BA.4/5, and XBB, assessing symptom risk, severity, duration, progression, and the impact of vaccination and previous infection within a representative Hong Kong community cohort.

Methods

In this prospective cohort study in Hong Kong, a representative community cohort of individuals aged ≥5 years were recruited by random-digit dialling and underwent weekly rapid antigen testing for SARS-CoV-2, irrespective of symptoms, during three periods from Mar 1, 2022, to Oct 31, 2023, in which the BA.2, BA.4/5, or XBB subvariants were dominant. We analysed the likelihood of symptoms, as well as the patterns, severity, and duration of symptoms and their associations with participant demographics and vaccination and infection histories.

Results

1126 (11·0%) of 10 279 participants in the BA.2 period, 830 (6·6%) of 12 588 in the BA.4/5 period, and 633 (11·1%) of 5690 during the XBB period tested positive for SARS-CoV-2 infection on rapid antigen tests. Community infections were generally mild, with asymptomatic infections comprising 22·0–25·0% of infections. No hospitalisations or deaths occurred as a direct result of SARS-CoV-2 infection during the study period.

Compared with children aged 5–17 years, a higher likelihood of being symptomatic on infection was found for adults aged 18–59 years during the period of BA.2 dominance and adults aged 60 years or older during XBB dominance. Most (>90·0%) participants with symptomatic infections reported respiratory and systemic symptoms. Up-to-date vaccination with a regimen containing the BNT162b2 vaccine, compared with those without an up-to-date vaccine, was associated with a reduced likelihood of symptoms on infection during the period of BA.2 dominance and of severe symptoms causing substantial disturbance to daily life (grade 3 symptoms) during

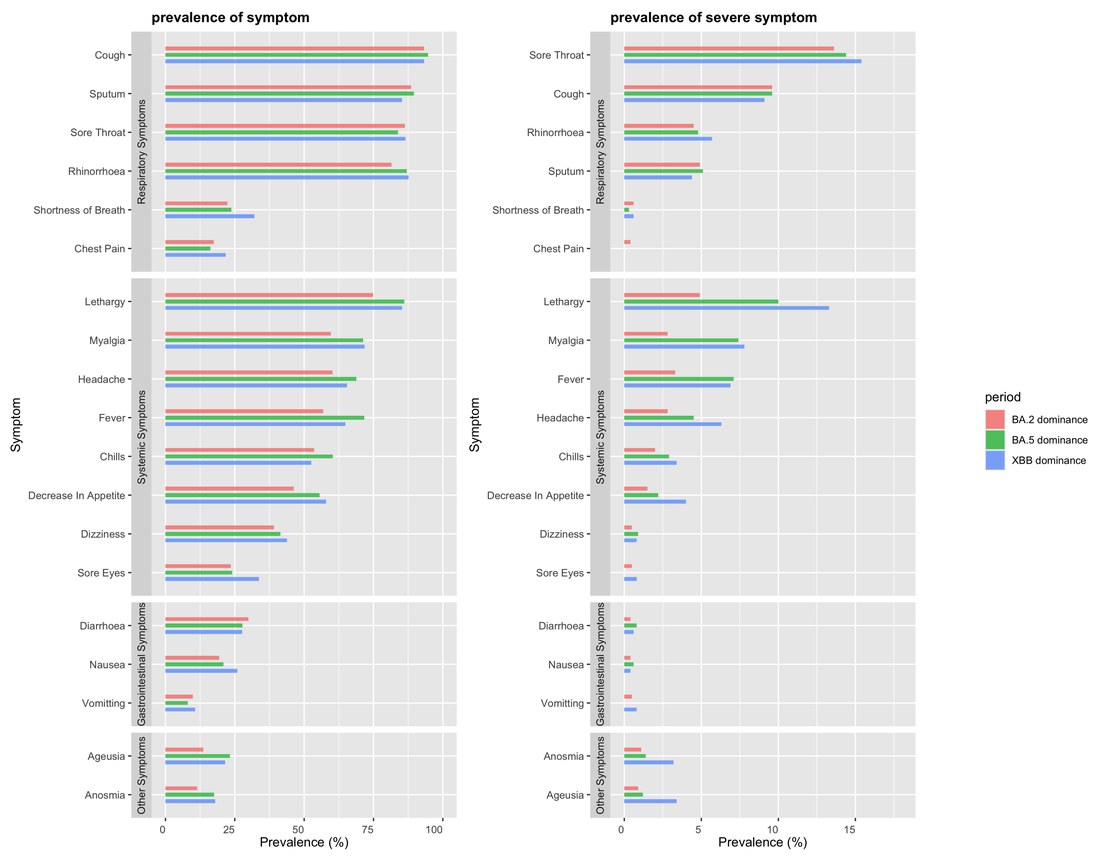
periods of BA.2 and BA.4/5 dominance, whereas no association was observed during the period of XBB dominance. Previous SARS-CoV-2 infection was associated with fewer reports of severe symptoms during XBB dominance.

Reports of severe symptoms increased over the three periods, from 236 (27·7%) of 852 symptomatic participants during BA.2 dominance to 176 (37·1%) of 475 during XBB dominance. The duration of symptoms was longest in the BA.2 period (median 10·0 days [IQR 7·0–14·0]. A symptom duration of 60 days or longer was reported only during the period of BA.2 dominance, in six (0·7%) of 824 infections.

Table 1. Characteristics of participants who tested positive for SARS-CoV-2

	Total infections during the three periods (N=2589)	Infections during the BA.2 period (N=1126)	Infections during the BA.4/5 period (N=830)	Infections during the XBB period (N=633)
Sex				
Female	1433 (55·3%, 53·4–57·2)	620 (55·1%, 52·2–58·0)	457 (55·1%, 51·7–58·5)	356 (56·2%, 52·3–60·1)
Male	1156 (44·7%, 42·8–46·6)	506 (44·9%, 42·0–47·8)	373 (44·9%, 41·5–48·3)	277 (43·8%, 40·9–48·7)
Age, years				
5–17	240 (9·3%, 8·2–10·4)	114 (10·1%, 8·3–11·9)	81 (9·8%, 7·8–11·8)	45 (7·1%, 5·1–9·1)
18–59	1793 (69·3%, 67·5–71·1)	790 (70·2%, 67·5–72·9)	574 (69·2%, 66·1–72·3)	429 (67·8%, 64·2–71·4)
≥60	556 (21·5%, 19·9–23·1)	222 (19·7%, 17·4–22·0)	175 (21·1%, 18·3–23·9)	159 (25·1%, 21·7–28·5)
Vaccination status				
Without up-to-date vaccine	2200 (85·0%, 83·6–86·4)	900 (79·9%, 77·6–82·2)	710 (85·5%, 83·1–87·9)	590 (93·2%, 91·2–95·2)
With up-to-date vaccine	389 (15·0%, 13·6–16·4)	226 (20·1%, 17·8–22·4)	120 (14·5%, 12·1–16·9)	43 (6·8%, 4·8–8·8)
Vaccine type*				
Exclusively BNT162b2	187 (7·2%, 6·2–8·2)	130 (11·5%, 9·6–13·4)	40 (4·8%, 3·3–6·3)	17 (2·7%, 1·4–4·0)
Exclusively CoronaVac	104 (4·0%, 3·2–4·8)	61 (5·4%, 4·1–6·7)	40 (4·8%, 3·3–6·3)	3 (0·5%, 0·0–1·0)
Mixed	98 (3·8%, 3·1–4·5)	35 (3·1%, 2·1–4·1)	40 (4·8%, 3·3–6·3)	23 (3·6%, 2·1–5·1)
Chronic disease				
Without	1995 (77·1%, 75·5–78·7)	877 (77·9%, 75·5–80·3)	660 (79·5%, 76·8–82·2)	458 (72·4%, 68·9–75·9)
With	594 (22·9%, 21·3–24·5)	249 (22·1%, 19·7–24·5)	170 (20·5%, 17·8–23·2)	175 (27·6%, 24·1–31·1)
Infection history‡				
Previously uninfected	2120 (81·9%, 80·4–83·4)	925 (82·1%, 79·9–84·3)	774 (93·3%, 91·6–95·0)	421 (66·5%, 62·8–70·2)
Previously infected	469 (18·1%, 16·6–19·6)	201 (17·9%, 15·7–20·1)	56 (6·7%, 5·0–8·4)	212 (33·5%, 29·8–37·2)

Figure 1. The percentage of reporting of each symptom and individual severe symptom



Conclusion

SARS-CoV-2 infections were generally mild, but not increasingly so, along the evolution of omicron variants subvariants in this highly vaccinated population. About one-third of symptomatic participants reported the symptoms severely affected daily life even if they were not admitted hospital, resulting in morbidity, absence from work or school due to illness, productivity loss, and increased medicoeconomic burden. A gradual reduction in the association of vaccines and increase in the association of previous infection with the symptom profile, possibly reflecting the effects of immune escape and waning, were observed over the study period.

References

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