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Research letter

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Variations in respiratory syncytial virus activity following the relaxation of COVID-19 restrictions in Qatar

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The introduction of non-pharmaceutical measures to mitigate the spread of coronavirus disease 2019 (COVID-19) has disrupted the seasonality of respiratory syncytial virus (RSV) worldwide. There was a near absence of RSV during the fall and winter of 2020–2021 with the implementation of restrictions, followed by an unusual re-emergence in the summer months coinciding with their relaxation.[1–6]

Qatar is a small country on the Arabian Peninsula with a subtropical desert climate in which RSV circulates year-round with a consistent surge between October and December.[7,8] This retrospective study assessed trends in RSV infection and RSV-related disease (RSVRD) at Sidra Medicine, a paediatric tertiary-care hospital and the main referral centre for the paediatric population of Qatar, comparing a typical peak of RSV activity in October–December 2019 with the same period in 2020 and 2021, during which pandemic restrictions were relaxed. We also examined the strength and direction of association between RSV activity and indicators of national and international mobility from March 2020 to December 2021 (Supplementary Methods, Supplementary data are available at *JTM* online).

In October–December 2019, RSV was detected in 486 of 2291 (21.2%) PCR tests performed on respiratory tract specimens. In contrast, RSV was detected in 8 (0.7%) of 1127 specimens in October–December 2020 (RR: 24.8; 95% CI, 12.4–49.8; $P < 0.0001$; Supplementary Figure 1, Supplementary data are available at *JTM* online). The likelihood of RSV-related disease (RSVRD) in the Paediatric Emergency Department (PED), Paediatric Intensive Care Unit (PICU) and General Paediatric Wards (GPW) decreased >78-fold, 57-fold and 147-fold, respectively, in October–December 2020 compared with 2019 (Supplementary Table 1, Supplementary data are available at *JTM* online).

In October–December 2021, RSV was detected in 334 of 1496 (22.3%) specimens (RR: 1; 95% CI, 0.8–1.1; Supplementary Figure 1, Supplementary data are available at *JTM* online). The likelihood of RSVRD in the PED and GPW decreased 2.5-fold and 1.7-fold, respectively, in October–December 2021 compared with 2019. In contrast, the incidence rates of RSVRD in PICU remained stable during the same quarters (Supplementary Table 1, Supplementary data are available at *JTM* online). The median age of RSVRD patients did not vary in the last quarters of 2019 (5 months; [IQR, 1–26.5]) and 2021 (5 months; [IQR, 2–34]). RSV infections peaked between the last week of October and the first week of November in both years.

Figure 1 shows monthly RSV infections and the trajectory of the monthly average of the mobility indicators. There was a strong positive correlation between RSV infections and the mobility trends for retail and recreation, and transit stations; a strong negative correlation between RSV infections and the residential index and Stringency Index (SI); and a very strong positive correlation between international visitors and RSV infections (Supplementary Table 2, Supplementary data are available at *JTM* online). The number of international visitors in October–December 2020 and 2021 declined by 96 and 47%, respectively, compared with 2019 (Supplementary Figure 2 and Supplementary Table 3, Supplementary data are available at *JTM* online).

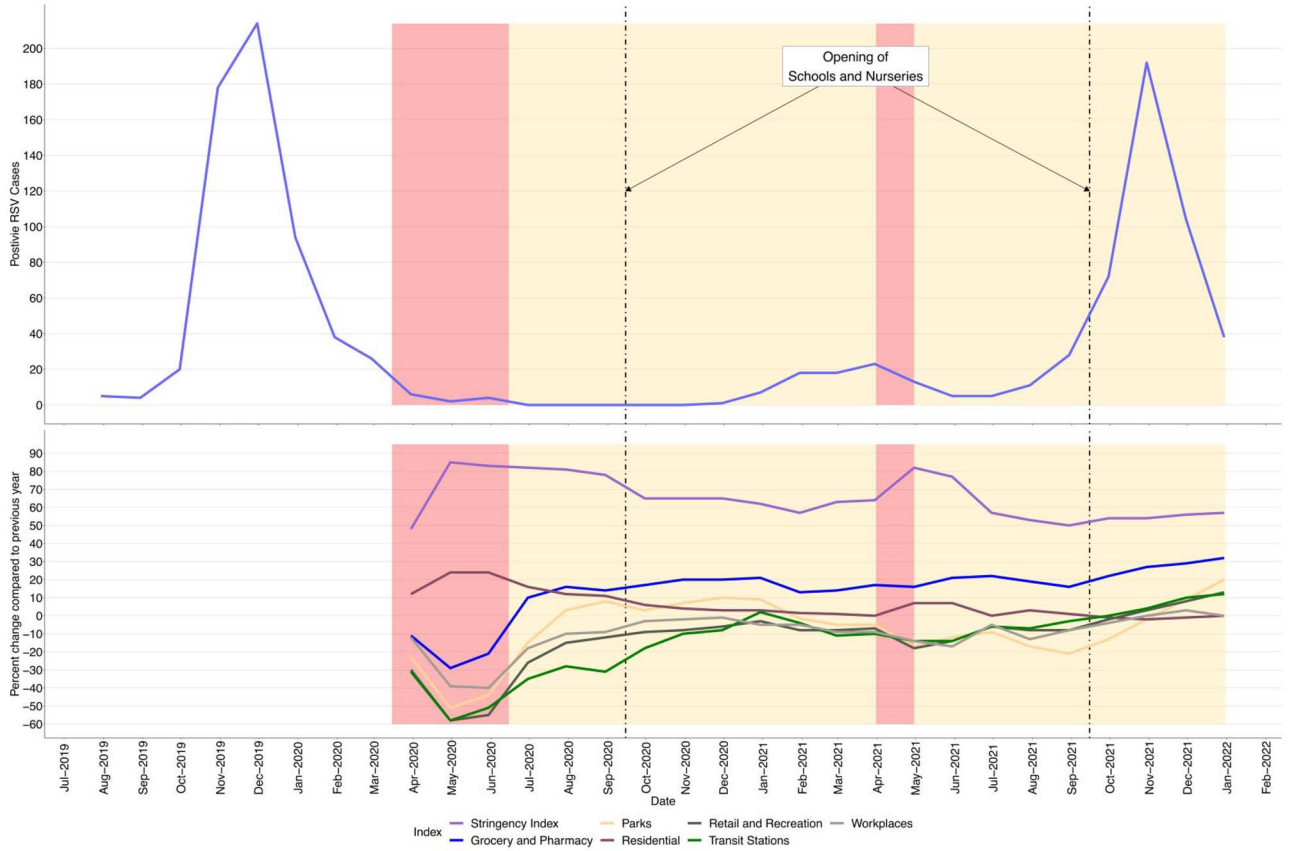

Figure 1. Monthly number of laboratory-confirmed RSV infections in children in Doha, Qatar, between July 2019 and December 2021. From March 2020 to December 2021, RSV infections are plotted against the Stringency Index from the Oxford COVID-19 Government Response Tracker, six community mobility indicators from the Google's Community Mobility Reports. The first and second lockdown and travel restriction periods are marked in red, and periods of progressive lockdown and restriction lifting are marked in yellow. The dashed lines mark the progressive start of in-person school and nursery operation following restriction lifting.

In mid-March 2020, Qatar implemented the COVID-19-related restrictions that included school closures, mandatory masking and an entry ban for foreign visitors. A phased relaxation of restrictions began in mid-June.[17] Despite the easing of restrictions in the fourth phase between October and December 2020, including reopening of nurseries and schools in a hybrid mode, the incidence of RSV infection and RSVRD remained remarkably low (>98% decreased compared with 2019). However, following a similar relaxation of restrictions imposed in March 2021, RSV infections began increasing in late summer. By the last quarter of 2021, RSV infections and RSVRD returned to a typical pre-COVID-19 seasonal pattern in Qatar, although the total number of laboratory-confirmed infections was ~70% of that in 2019.

Although the mobility indicators improved in October–December 2021 compared with 2020, the amount of change was not significant. For example, the level of SI varied from 54 to 65, within a range that is not associated with major disruptions of social activities and domestic movement.[9] Conversely, there were significant differences in the international travel restrictions during autumn months in both years that could contribute to the variable incidence of RSV detection and RSVRD. Since expatriates constitute >85% of Qatar's population, including a significant proportion from the Indian subcontinent,[10] the relaxation of international travel restrictions in summer 2021 could facilitate travel to regions experiencing unusually high incidence of RSV including summertime outbreaks in Europe and North America, winter resurgence in Australia and outbreaks during the monsoons on the Indian subcontinent.[1–6] Thus it is possible that the earlier onset of the RSV season in Qatar in late summer 2021 (Figure 1 and Supplementary Figure 1, Supplementary data are available at *JTM* online) could be partially attributed to returning residents importing RSV from other regions.

Our study has several limitations. First, since our data were hospital-based, it may not reflect RSV activity in the outpatient and community settings. Second, we could not determine the extent to which travel restrictions could curb the spread of RSV in the absence of domestic mobility restrictions. Finally, we did not assess nor control for other potential confounding factors such as temperature and relative humidity.

In summary, our findings suggest that the remarkable variations in RSV transmission dynamics during the relaxation of COVID-19 measures in Qatar in late 2020 and 2021 could be mainly attributed to the number of international arrivals and the introduction of RSV from different regions. Policymakers in the Arabian Peninsula that share similar demographic and international travel patterns with Qatar should be aware

that the normalization of international travel following COVID-19 restrictions can dramatically alter RSV activity and may pose potential challenges to hospital resources and the need for palivizumab prophylaxis.

Authors' Contributions

APL designed the study, collected and analysed data and drafted the manuscript. HAM teamed up with APL to design the study, performed the statistical analysis and revised the manuscript. MI and MS collaborated with data analysis and revised the manuscript. MRH collaborated with designing the study and the statistical analysis and revised the manuscript. PT coordinated and supervised the execution of the study and finalized the manuscript. All authors read and approved the final version of the manuscript.

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Conflict of Interest

The authors have no conflicts of interest.

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