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Brief Report

The impact of COVID-19 and masking practices on pertussis cases at a large academic medical center (2019–2021)

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NARRATIVE ABSTRACT

We reviewed cases of *Bordetella pertussis* (*B. pertussis*) cases in ambulatory clinics at a large academic health care institution in Los Angeles from 2019–2021. Public health prevention measures during the Coronavirus disease 19 (COVID-19) pandemic impacted the number of pertussis cases identified.

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Pertussis, is a respiratory disease caused by the bacterium, *Bordetella pertussis* (*B. pertussis*). Spread rapidly through droplet transmission, it can affect individuals of all ages.^{1,2} When patients seek care, the risk of transmission (RO = 12–15)² to other patients and health care workers (HCW) can be high.^{1,2} This risk results in increased costs to health care facilities due to investigation, antimicrobial prophylaxis, and post exposure treatment and care.^{1,3}

Vaccination is the best way to prevent pertussis infection. In California, vaccination against pertussis is required to attend public schools including colleges and universities.⁴ Pertussis vaccines, however, have waning immunity, with maximum protection occurring in the 2 years after vaccination.⁵ As the Coronavirus disease 19 (COVID-19) pandemic emerged, universal masking, requiring adherence to masking in public, was utilized to reduce the spread of illness. COVID-19 also led to children staying home from school, and impacted primary care visits where routine vaccines are given.⁶ We sought to evaluate the impact of COVID-19 mitigation measures on the number of primary pertussis cases in patients and secondary cases in staff members at ambulatory clinics at our institution before and after the COVID-19 pandemic.

METHODS

This study is a retrospective analysis of *B. pertussis* cases collected from January 1, 2019 to December 31, 2021 in the

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Tessa Sandoval and Anjali Bisht contributed equally to this paper.

ambulatory setting comprising of over 200 clinics in a large academic health care system in Los Angeles (LA), California. The study population was classified as all patients who presented to a clinic and had *B. pertussis* detected through polymerase chain reaction via nasopharyngeal specimen.

Positive cases were identified from daily reports of abnormal polymerase chain reaction pertussis results. Demographic characteristics were collected via chart review. When a *B. pertussis* case was identified, the Clinical Epidemiology and Infection Prevention department contacted the clinic to identify patients and/or HCWs who were exposed to the index case. Exposure was identified by contacting clinics for presence of masking. As visits were limited to general care visits, exposure was defined as not wearing a mask when within 3 feet of patient while the patient was not wearing a mask. HCWs that met the exposure definition were referred to Occupational Health for follow up.

Data was collected from Occupational Health for HCW exposure and antibiotic prophylaxis (azithromycin). HCWs who received postexposure prophylaxis (PEP) was exposed and accepted or requested PEP.

RESULTS

From January 2019 to December 2021, 215 cases of *B. pertussis* were identified at our health system (Table 1). Most were male (55.3%) and patients ranged in age from 2 months to 71 years. Cough with upper respiratory symptoms were the most common symptom presentation (46.0%), followed by cough alone (39.5%). Patients with a known school exposure source decreased from 38.3% in 2019 to 16.7% and 0% in 2020 and 2021, respectively. The

Table 1

Patient characteristics of positive *Bordatella pertussis* PCR result collected in the ambulatory setting from a large academic health care system in LA, CA

Year	2019	2020	2021	Overall
Cases positive for pertussis	198	12	5	215
Total pertussis tests ordered	2302	339	235	2876
Percent positivity (%)	8.60	3.54	2.13	7.47
Sex n (%)				
Female	92 (45.5)	3 (25)	1 (20)	96 (44.7)
Male	106 (53.5)	9 (75)	4 (80)	119 (55.3)
Age				
mean (y)	16 y	16 y	4 y	16 y
min, max	2 mo, 71 y	4 mo, 56 y	5 mo, 6 y	2 mo, 71 y
Symptoms n (%)				
Cough with URI sx	90 (45.4)	5 (41.7)	4 (80)	99 (46.0)
Cough	83 (41.9)	1 (8.3)	1 (20)	85 (39.5)
Cough w/ post-tussive emesis	7 (3.5)	3 (25)	0 (0)	10 (4.7)
Congestion	3 (1.5)	0 (0)	0 (0)	3 (1.4)
Cough w/ paroxysmal episodes	3 (1.5)	0 (0)	0 (0)	3 (1.4)
Cough w/ URI Sx post-tussive emesis	3 (1.5)	0 (0)	0 (0)	3 (1.4)
Cough with whoop	1 (0.5)	3 (25)	0 (0)	4 (1.9)
No symptoms/unknown	8 (4.0)	0 (0)	0 (0)	8 (3.7)
Duration of symptoms (d)				
Mean	10	19	20	11
min, max	0, 56	2, 52	7, 30	0, 56
Known exposure n (%)				
No known exposure	77 (38.9)	9 (75)	4 (80)	90 (41.9)
School	76 (38.4)	2 (16.7)	0 (0)	78 (36.3)
Family	19 (9.6)	1 (8.3)	1 (20)	21 (9.8)
Y, Location unspecified	11 (5.6)	0 (0)	0 (0)	11 (5.1)
Friend	8 (4.0)	0 (0)	0 (0)	8 (3.7)
Extracurricular	4 (2.0)	0 (0)	0 (0)	4 (1.9)
Camp	2 (1.0)	0 (0)	0 (0)	2 (0.9)
Work	1 (0.5)	0 (0)	0 (0)	1 (0.4)
Vaccinated n (%)				
Yes	177 (89.4)	12 (100)	5 (100)	194 (90.2)
No/unknown	21 (10.6)	0	0	21 (9.8)

majority of positive cases in 2019 had been vaccinated against pertussis (89.4%), and all positive cases in 2020 and 2021 were vaccinated.

From the 215 cases of *B. pertussis*, 272 HCWs were exposed. Through follow-up with the clinic, no additional exposed patients were identified as secondary cases. As seen in Figure 1, HCW exposures peaked in May and July of 2019 which correlated with increased patient cases. 41 HCW (15.1%) were given azithromycin as PEP. There were no reported HCW exposures to *B. pertussis* after March 2020. In the three years, no secondary HCW exposures were identified.

There was a statistically significant difference in cases from 2019 compared to 2020 and 2021 (each *P*-value <.01). The decrease in cases coincided with the onset of the COVID-19 pandemic along with California State and LA County local stay at home orders activated March 16th 2020 and lifted June 15th 2021.^{5,7,8}

DISCUSSION

We found that the number of *B. pertussis* patients significantly decreased after the onset of the COVID-19 pandemic. Variables which accounted for this decrease include the California Stay-at-Home Order (including school closures) and masking requirements in public and health care settings.⁷ At the system where this study occurred, permissive, or allowance of masking began on March 26th, 2020, and universal masking began on April 16th, 2020 which correlated with the drop in pertussis cases (Fig 1). *B. pertussis* cases dropped both nationally and statewide.⁹ *B. pertussis* cases for 2019, 2020, and 2021 in the LA jurisdiction were 1,008, 87, and 0 respectively.⁹ This suggests the prevention strategies employed during the COVID-19 pandemic were beneficial to the reduction of *B. pertussis* cases.

As many positive cases were fully vaccinated against pertussis, this data suggests waning immunity is a contributing factor to acquiring pertussis.⁶

Limitations to this study include that the number of *B. pertussis* patients could be higher due to decreased physician appointments during the pandemic. This was reflected in the reduced number of pertussis tests ordered in 2021 and 2022. Drops in annual physician visits during the pandemic could have decreased vaccination rates against *B. pertussis*, therefore future spikes in rates remains unknown.⁶ Reliance of vaccination status was based on immunization information present in a patient’s chart which could have been incomplete. Additionally, positive cases observed are from a single system, however, the trend does follow that of LA County.⁹

Our findings demonstrate that masking can impact respiratory disease transmission outside of COVID-19. These results are of clinical importance in health care as they show how wearing a mask with symptomatic respiratory patients can be beneficial in reducing exposure and PEP need.

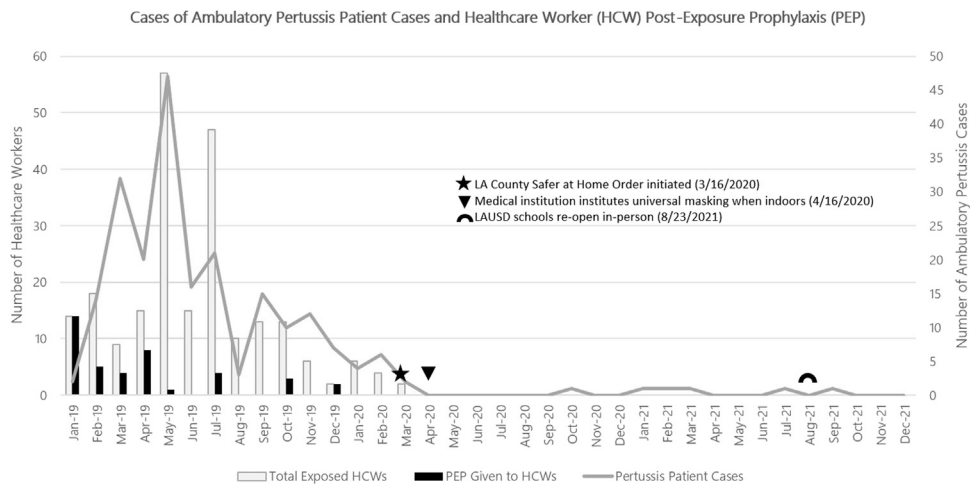


Fig 1. Cases of ambulatory *Bordatella pertussis* and HCW who received PEP.

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References

1. Calderón TA, Coffin SE, Sammons JS. Preventing the spread of pertussis in pediatric healthcare settings. *J Pediatr Infect Dis Soc.* 2015;4:252–259.
2. Pertussis frequently asked questions. Accessed March 1, 2022. <https://www.cdc.gov/pertussis/about/faqs.html#contagious>.
3. Zivna I, Bergin D, Casavanat J, et al. Impact of Bordetella pertussis exposures on a Massachusetts tertiary care medical system. *Infect Control Hosp Epidemiol.* 2007;28:708–712.
4. Shots required for TK-12 and 7th Grade. Accessed March 1, 2022. <https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/School/tk-12-immunizations.aspx>.
5. A safer return to work and in the community. Accessed March 1, 2022. https://trails.lacounty.gov/Files/Documents/1181/HOO_SaferReturnWorkCommunity.pdf.
6. Teasdale CA, Borrell LN, Shen Y, et al. Missed routine pediatric care and vaccinations in US children during the first year of the COVID-19 pandemic. *Prevent Med.* 2022;158:107025.
7. Executive order N-33-20. Accessed March 1, 2022. <https://www.gov.ca.gov/wp-content/uploads/2020/03/3.19.20-attested-EO-N-33-20-COVID-19-HEALTH-ORDER.pdf>.
8. Safer at home order for control of COVID-19. Accessed March 1, 2022. https://covid19.lacounty.gov/wp-content/uploads/HOO_Safer-at-Home-Order-for-Control-of-COVID_04102020.pdf?msclkid=1abb7b42c59011eca73dd9d052b14ecb.
9. 2021 provisional pertussis surveillance report. Accessed March 1, 2022. https://www.cdc.gov/pertussis/downloads/pertuss-surv-report-2021_PROVISIONAL.pdf.