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LETTER

Impact of the COVID-19 pandemic on the detection of TB in Shanghai, China

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Dear Editor,

TB remains a major public health threat globally, but the TB epidemic may be exacerbated by the COVID-19 pandemic.[1,2] Reports have suggested that TB detection and health care has declined during lockdown.[3,4] To contain the spread of COVID-19, Shanghai, China (population: 24 million) initiated a Level 1 public health emergency response[5] on 24 January 2020 (at the beginning of the Chinese New Year holiday [CNY]). Public gatherings were banned, travel restrictions imposed and social distancing implemented.[6] Medical resources (both health care workers and materials) were prioritised for COVID-19. Six of 26 county-level TB clinics were closed and two of four tertiary TB hospitals halved outpatient visits and the number of hospital beds. On 24 March, the emergency response was lowered to Level 2. With social distancing still in effect, people began to resume work and return to normal life, and

hospitals gradually returned to routine work. This study aims to examine the impact of the COVID-19 on TB detection in Shanghai during this period.

This was a cross-sectional study using routinely collected TB control programme data and public COVID-19 data. TB patients were diagnosed and reported as per the Chinese national standard of diagnosis for TB.[7] We included all bacteriologically confirmed and clinically diagnosed TB patients identified from 1 November 2019 through to 28 May 2020. Patients identified in the same period of 2018–2019 (from 1 November 2018 through 29 May 2019) were also enrolled for comparison. The number of days were identical because of the leap year in 2020. We calculated and plotted weekly notification rates (notified cases per 1,000,000 person-weeks) of TB and local COVID-19, with lines smoothed using the Loess method.

We divided the study period into three parts: pre-lockdown (from 1 November 2019 to 23 January 2020), lockdown (from 24 January to 26 March 2020) and post-lockdown (from 27 March to 28 May 2020). We used 26 March instead of 23 March as the end of the lockdown period to avoid the split in a whole week. Notification rates during the lockdown and post-lockdown periods were compared with those in the pre-lockdown period. These rates were also compared with those during their corresponding periods in 2018–2019. Incidence rate ratios (IRRs) and 95% confidence intervals (CIs) (calculated using exact methods [mid-p]) were used for the comparisons between periods. Demographic and clinical characteristics were compared between patients reported in the pre-lockdown and lockdown periods in 2019–2020. Diagnosis delay was defined as days from the date of self-reported onset of TB-related symptoms to the date when TB was confirmed or clinically diagnosed. The analysis was performed using R® Software v3.6.2 (R Computing, Vienna, Austria). $P < 0.05$ was considered significant.

The study was approved by the Ethical Review Committee at Shanghai Municipal Center for Disease Control and Prevention, Shanghai, China. Since only anonymised secondary data were used, no informed consent was sought.

The data for 727,199,820 person-weeks and 2846 TB cases from 1 November

2019 to 28 May 2020 were analysed. The TB notification rate decreased by 47.8% from 4.6 (95%CI 4.3–4.8) per 1,000,000 person-weeks during the pre-lockdown period to 2.4 (95%CI 2.2–2.6) per 1,000,000 person-weeks during the lockdown period (IRR 0.5, 95% CI 0.5–0.6; $P < 0.001$). Case notifications began to rebound in mid- to late-February 2020 (because COVID-19 rates declined), and kept rising steadily after the lockdown order was lifted (see Figure). The rate in the post-lockdown period was almost the same as that in the pre-lockdown period (post-lockdown: 4.5 vs. pre-lockdown: 4.6, per 1,000,000 person-weeks; IRR 1.0, 95% CI 0.9–1.1; $P = 0.774$). When compared with those in the same periods in 2018–2019, the rates during the lockdown (IRR 0.6, 95% CI 0.5–0.7; $P < 0.001$) and post-lockdown (IRR 0.9, 95% CI 0.8–1.0; $P = 0.009$) periods were significantly lower, while the rate during the pre-lockdown period remains similar (IRR 1.0, 95% CI 0.9–1.0; $P = 0.179$).

Demographic and clinical characteristics such as age, sex, residents or migrants, new or previously treated patients, and with or without cavity on X-ray varied little between patients reported in the pre-lockdown and lockdown periods (all $P > 0.05$). However, patients identified during the lockdown period had less access to sputum smear examination (pre-lockdown: 95.7% vs. lockdown: 86.2%, $P < 0.001$) and Xpert® MTB/RIF testing (Cepheid, Sunnyvale, CA, USA) (pre-lockdown: 79.5% vs. lockdown: 66.9%; $P < 0.001$), but more diagnosis delays (pre-lockdown: 15, interquartile range [IQR] 6–29 vs. lockdown: 18.5, IQR 9–33; $P < 0.001$).

We observed a significant decline in TB detection during the COVID-19 pandemic in Shanghai, more than that reported in Korea, Japan, and Taiwan.[8–10] This might be caused by more aggressive public health strategies adopted in Shanghai[6] owing to its close link to the epicentre in Wuhan, Hubei Province. One study found TB diagnoses dropped during holidays due to reduced clinical activities,[11] which may well explain the decline in TB notification rates during the CNY holiday in 2019, as rates increased as the holiday ended. However, the drop in 2020 was more pronounced and the upturn occurred at least 2 weeks after the end of the CNY holiday,

which indicated the effect of the COVID-19 pandemic. During the pandemic, people reduced seeking health care due to insufficient and delayed provision of TB services.[4,12,13] We also observed that the lockdown period led to poor access to diagnostic tests and prolonged diagnosis delay for TB patients. Lai et al.[10] suggested that social distancing helped to reduce TB incidence via control of TB transmission. In Shanghai, the TB notification rates increased rapidly after the lockdown order was lifted and approached the level of the same period in 2019. Because TB has a long incubation period, the benefit of short-term transmission control measures on TB incidence is reduced.[9,14] As the Figure indicates, the upturn in the TB notification rates occurred in mid- to late February 2020, when the COVID-19 rates began to decline. This might be explained by the resulting transfer of medical resources from combating COVID-19 (as its incidence declined) back to TB services. This also emphasises the need to build an emergency response programme to ensure ongoing TB health care during any future pandemic.

A limitation of this study is the potential underestimate of TB detection during the pandemic due to the use of notification data. Although TB is compulsorily notifiable, it might be underreported because of insufficient TB care staff during the pandemic.

In conclusion, the detection of TB was adversely impacted by COVID-19 in Shanghai, China. It is necessary to improve emergency response programmes to minimise the effects of COVID-19 (and any future emerging pathogen) on the control of TB and other chronic infectious diseases.

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Conflicts of interest: none declared.

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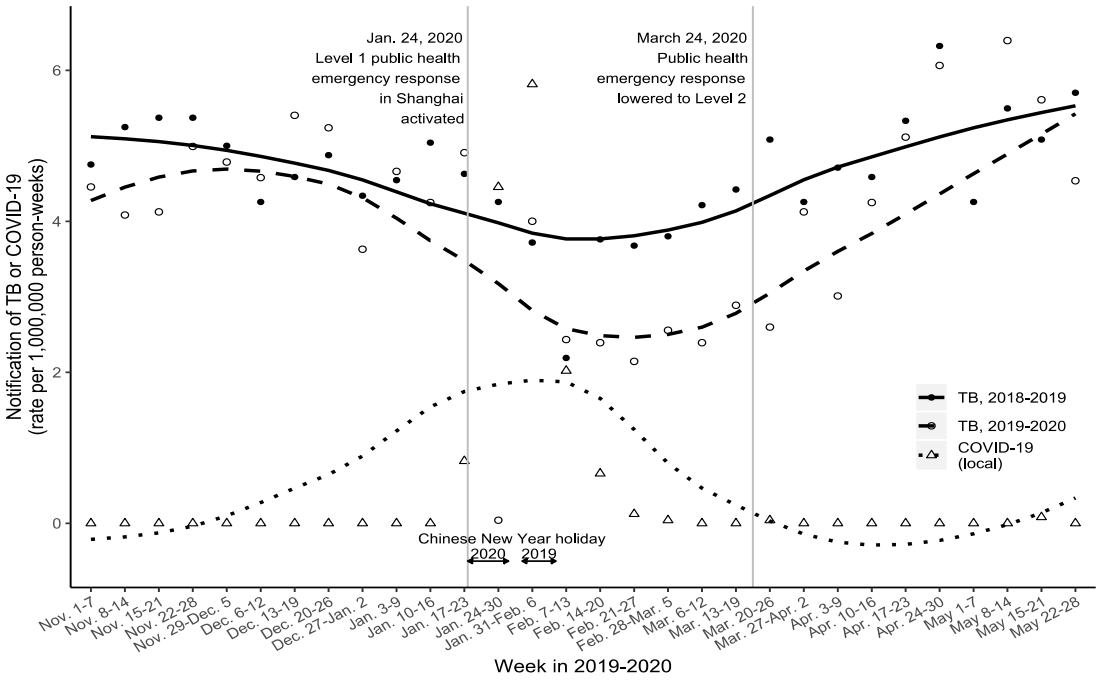
Figure. Weekly notification rates for TB from 1 November to 28 May during both 2018–2019 and 2019–2020 in Shanghai, China, against the notification rates of the COVID-19. The solid line and solid circles indicate TB notification rates in 2018–2019, whereas the dashed line and hollow circles indicate those in 2019–2020. Extrapulmonary TB and tuberculous pleurisy cases were excluded. The dotted line and hollow triangles show the rate of COVID-19. Only local COVID-19 cases were included (imported cases were excluded). Notification rates are given as cases per 1,000,000 person-weeks.


Jan. 24, 2020
Level 1 public health
emergency response
in Shanghai
activated
March 24, 2020
Public health
emergency response
lowered to Level 2
Notification of TB or COVID-19
(rate per 1,000,000 person-weeks)
TB, 2018-2019
TB, 2019-2020
COVID-19
(local)
Chinese New Year holiday
2020 2019
Week in 2019-2020