

# Guidelines for the Prevention and Control of Tuberculosis in Schools: Recommendations from China CDC

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China is still a high tuberculosis (TB) burden country, and the number of new cases of TB was 833,000 in 2019 (1). School campuses are highly-crowded places with potential for close contact, which suggests that a few cases of TB may lead to a large outbreak. Thus, TB prevention and control in schools is an important disease control challenge for educational and health departments at all levels. In 2017, the former National Health and Family Planning Commission (now known as the National Health Commission, NHC) and the Ministry of Education jointly revised and issued the “School Tuberculosis Prevention and Control Work Regulations (2017 Edition)” (hereafter referred to as “School Regulations”) (2). Based on the regulations, China CDC organized experts to formulate the “Guidelines for the Prevention and Control of Tuberculosis in Chinese Schools” (referred to as “School Guidelines”) to standardize and refine the recommendations for implementation.

## BACKGROUND

The total number of students in China has remained as around 250 million since 2008. Students in nurseries/kindergartens, elementary schools, junior and senior high schools, and colleges/universities account for about 20%, 40%, 30%, and 10% of all students (3), respectively. The majority of students were between 3–24 years old, and the proportion of boarding school students is increasing.

In recent years, TB notified case numbers in students were around 48,000 per year with a reported incidence of about 1/3 of the general population. About 85% of all student cases were reported from senior high schools and colleges, aged between 15–24 years old (4). Most reported TB public health emergencies happened in senior high schools with several common features: cases mainly occurred in boarding schools; the proportion of bacteriologically confirmed cases was low; and emergencies in low-risk areas mostly occurred in schools with concentrated students immigrated from high-risk areas.

## METHODS

China CDC organized the first expert discussion meeting in Chongqing Municipality in July 2017. During this meeting, experts determined the main structure and details of the “School Guidelines”. A total of 18 experts from different disciplines participated, formed the drafting group, and then developed the first draft of the guidelines based on existing research evidence and practical experiences. In November and December 2018, the draft was sent to all 31 provincial-level administrative division (PLADs) agencies for TB prevention to collect their opinions for revision. In January 2019, an educational system expert seminar was held in Nanjing City, and several small-scale expert seminars were organized later. In November 2019, 20 experts from the NHC, the National TB Expert Advisory Committee, China CDC, provincial-level educational administrative departments, and university hospitals that specialized in TB diagnosis, TB treatment, epidemiology, laboratory techniques, TB prevention and control, education and school health, reviewed and finalized the guidelines.

## RATIONALE

The school regulations specify prevention and control measures in 3 different scenarios: routine control with no active cases, detection of sporadic cases, and public health emergencies (Figure 1). Based on research evidence and field experiences, the school guidelines refined control measures, gave guidance on the application of several new technical instruments, and provided more practical recording tools for practice.

## RECOMMENDATIONS

### Health Examination

The school entrance examination for newly enrolled

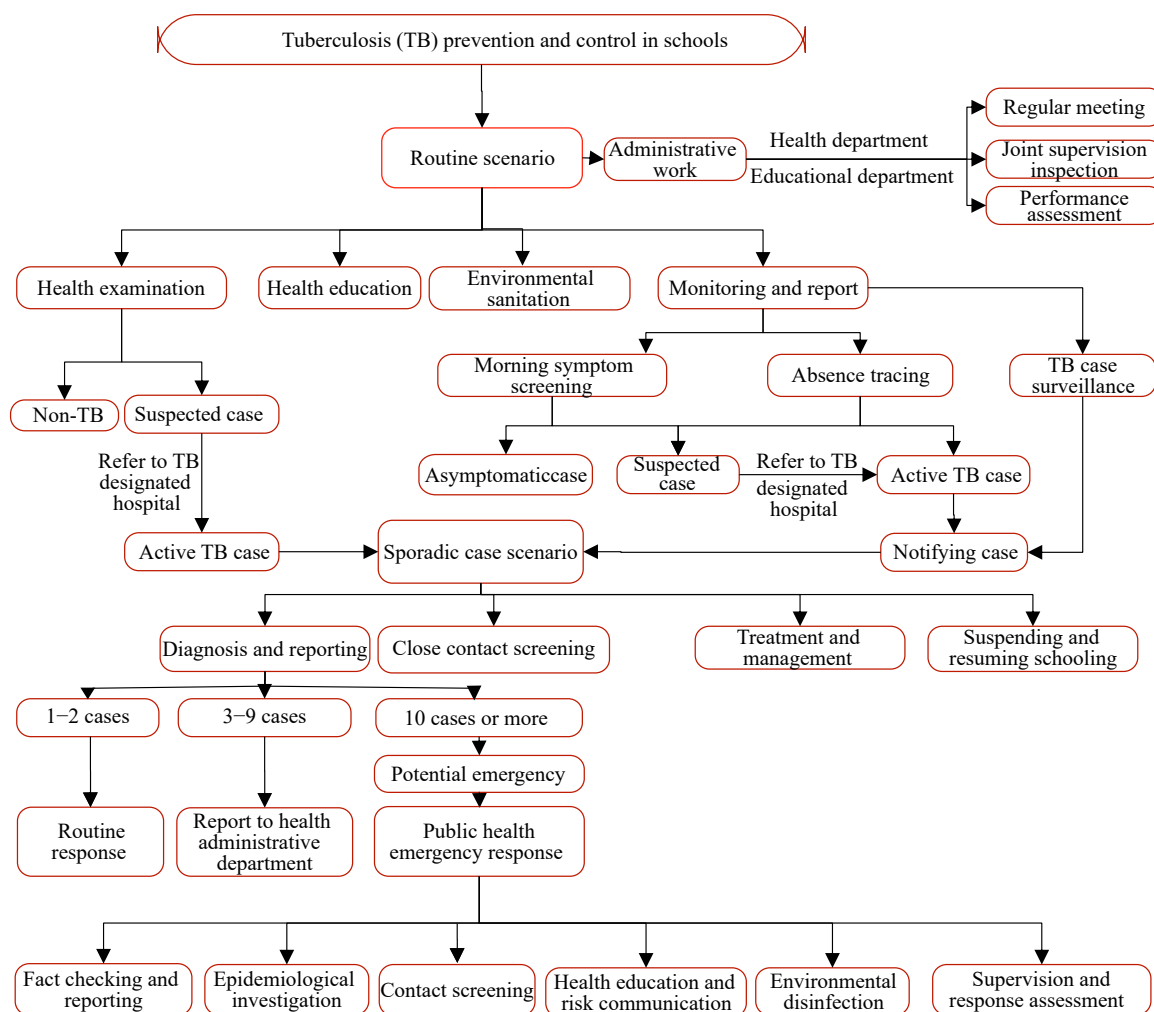


FIGURE 1. Tuberculosis prevention and control measures in school in three different scenarios. The 3 different scenarios including: routine control with no active cases, detection of sporadic cases, and public health emergencies.

students should be completed before entering the school, or as latest as within 1 month after the start of school life (examinations required were listed in Table 1). All faculty and staff must undergo a health examination before joining the school, and routine health examinations should be performed once a year.

### On-campus Health Education and School Environmental Sanitation

Various sorts of health education should be conducted for educational administrative departments, school principals, school doctors, teachers, students, and their parents. According to national school hygiene standards, schools should guarantee space per capita for classrooms and dormitories and strengthen the ventilation and sanitation of mass gathering venues.

### On-campus Symptom and Absence Monitoring and Reporting

Nurseries/kindergartens, elementary and high schools should carry out morning symptom checks every day (5). Symptoms, such as cough and expectoration, should be recorded and reported to the school medical office. The student with suspicious symptoms of TB should be transferred to the local designated TB hospitals for diagnosis. For absent students, their teachers should verify whether the absence is due to illness, especially for students with presumptive TB or with suspicious symptoms of TB. For suspected or diagnosed TB patients, isolation or suspending schooling may be necessary.

### Active Surveillance By Medical Facilities

For pulmonary tuberculosis (PTB) patients aged

TABLE 1. Health examination at entry of different schools.

| School type  | Examination methods   |
|--|---|
| Nurseries /kindergartens, elementary schools, and non-boarding junior high schools | First, history of close contact with tuberculosis (TB) patients and TB-like symptoms are checked. For children and students with a history of close contact with TB cases or suspicious symptoms, tuberculin skin test (TST) should be performed. For students who have contraindications for TST testing, the $\gamma$ -interferon release test (IGRA) can be used for instead. For those with suspicious symptoms or strongly positive TST ( $\geq 15$ mm or with double circle, blistering, necrosis or lymphangitis) or IGRA positive results, chest X-ray examination should be performed. |
| Senior high schools and boarding junior high schools                               | First, TB-like symptoms are checked and TST or IGRA tested. Chest X-rays should be performed on those with suspicious symptoms or strongly positive TST tests or IGRA positive results.   |
| Colleges and universities  | First, TB-like symptoms should be checked, and chest X-ray examination taken. High risk areas and high-risk schools can carry out TST or IGRA test at the same time.  |

between 3–24 years old, hospitals must check whether the patient is a student and report the name of the school, class, and other information in the National Infectious Disease Reporting System. The National Infectious Diseases Automatic Alert and Response System will send a single-case alert for every PTB case notified as being “in nursery/kindergarten”, “student”, “teacher”, and/or aged 3–24 years old (6). After receiving an alert, the local CDC should promptly verify the information, contact the school, and start contact screening. The local CDC should also regularly analyze the TB epidemic situation in schools within their jurisdiction and conduct public media monitoring to detect clustered epidemics at an early stage.

### Patient Diagnosis, Treatment And Management

TB diagnosis should be made based on patient contact history, symptoms, signs, imaging, and laboratory examination results (7). Treatment course will be determined based on reliable drug susceptibility test results, considering age, weight, and conditions of disease. Supervision of drug intake and support will be performed through the whole course of treatment. Students may need to suspend schooling until getting proof of recovery and non-infectivity.

### Contact Screening

Contacts can be divided into 3 categories (Table 2). The primary screening is generally limited to the close contacts. If a new case is detected or a high tuberculin skin test (TST) strongly positive rate is observed, screening should be expanded to general contacts or even larger scales. See Table 2 for screening approaches and post-screening actions.

### Preventative Treatment

The preventative treatment subjects are those

excluding active PTB and including one or more scenarios: a strongly positive TST test result, TST net value increasing by  $\geq 10$  mm within two years,  $\gamma$ -interferon release test (IGRA) positive, or HIV/AIDS positive and TST  $\geq 5$  mm. Preventative treatment will be given with informed consent, choices of regimen are 3 months of rifampicin+isoniazid/rifapentine+isoniazid, 6–9 months of isoniazid, or 4 months of rifampicin (8). A drug intake supervision will be provided. Routine blood tests and liver and kidney function tests will be performed at the second weekend and the end of every month after.

### Infection Control

Schools should construct the building properly and establish a ventilation system in accordance to the national standards (9). Suspected and diagnosed TB patients who meet the conditions of schooling suspension will be placed under medical isolation or home isolation. UV radiation, chemical disinfection, etc., should be used in classrooms, dormitories, and other places that infectious patients have stayed.

### Response To Clustered Epidemic

Once  $\geq 3$  TB cases are detected in the same school, the local county CDC should complete a field epidemiological survey within 3 working days and contact screening within 10 working days. The school should conduct health education, symptom monitoring, and environmental disinfection promptly. When a school has  $\geq 10$  epidemiologically-linked TB cases or  $\geq 1$  death from TB in the same semester, the county level (or its superior level) health administrative department can determine whether to declare a public health emergency. Once confirmed, the emergency should be reported within 2 hours, an emergency plan should be initiated (10), and an emergency response carried out according to risk assessment results.

TABLE 2. Pulmonary tuberculosis case contact screening and post-screening actions.

| Subject  | Definitions/Approaches/Actions  |
|--|---|
| Screening subject classification   |   |
| Close contacts <sup>†</sup>  | Teachers and students in the same class with the index patient (diagnosed pulmonary tuberculosis cases including tuberculosis pleurisy patients), and students who live together in the same dormitory with the index patient.<br>Family members who have been in contact with the index patient in the same residence for $\geq 7$ days within 3 months prior to diagnosis and 14 days after initiation of treatment.<br>Other close contacts that are difficult to define in classes and dormitories, who have direct contact with the index patient (bacteriologically confirmed cases, or bacteriologically negative but having severe tuberculosis or showing obvious symptoms) in an enclosed space for $\geq 8$ hours continuously or for $\geq 40$ hours cumulatively within 3 months prior to diagnosis and 14 days after initiation of treatment. For other bacteriologically negative patients, the cumulative contact period of 40 hours is only calculated for the month prior to diagnosis of the index case. |
| General contacts   | Those who study and live together with the index patient on the same floor of teaching or dormitory building.   |
| Occasional contacts  | Those who are in the same teaching or dormitory building but not on the same floor with the index patient, or other teachers and students who occasionally have contact.  |
| Screening approaches   |   |
| Contact age <15 years old  | Symptom screening and tuberculin skin test(TST)/ $\gamma$ -interferon release test (IGRA); if TST strongly positive or IGRA positive, should add chest X-ray examination.   |
| Contact age $\geq 15$ years old  | Symptom screening, TST/IGRA, and chest X-ray examination.   |
| Suspected tuberculosis (TB) cases (those with suspicious symptoms of TB, TST strongly positive /IGRA positive, or abnormality in chest X-rays) | Bacteriological tests, including smear, culture, and molecular diagnostic tests.  |
| Bacteriologically confirmed TB cases   | Strain identification and drug susceptibility test. If feasible, it is recommended to keep the strains in order to carry out homology testing between strains collected from other cases afterwards.  |
| Post-screening actions   |   |
| Active TB patients   | Start standard anti-TB treatment and drug taking supervision and management as soon as possible   |
| Suspected TB patients  | Be quarantined temporarily, after diagnosis or exclusion, taking follow-up actions accordingly.   |
| Those with strongly positive TST ( $\geq 15$ mm) or positive IGRA results  | Should receive preventive treatment with informed consent. For those who refuse, monitoring and follow-up observation should be strengthened to make sure they will go to the TB designated hospital in time if TB-like symptoms appear. Also, they should take a chest X-ray examination at 3, 6, and 12 months later. When the contact screening finds 3 or more epidemiological-related TB cases in a school, preventive treatment is strongly recommended for all eligible students.  |
| Those with moderately positive (10–14 mm) and mildly positive TST (5–9 mm) results   | Should receive health education and strengthened follow-up observation, once TB-like symptoms appear, they should go to a TB-designated hospital promptly. When there are 3 or more epidemiologically-linked cases, it is recommended to perform chest X-ray examination again after 3 months.  |
| Those with negative TST (<5 mm) or IGRA results <sup>†</sup>   | Should receive health education and strengthened follow-up observation. If TB-like symptoms occur, they should go to a TB-designated hospital for TB examination promptly.  |

\* If time from the onset of symptoms to diagnosis is more than 3 months, the above definitions of infectious period of index patient should be updated to be from the onset of symptoms to 14 days after initiation of treatment

<sup>†</sup> For contacts with negative TST/IGRA results, when the outbreak in school is defined as a public health emergency, TST or IGRA should be performed again after 3 months, and chest X-rays should be taken for those with positive conversion. When there are 3 or more epidemiologically linked cases that have not yet constituted a public health emergency, it is recommended to conduct TST or IGRA again after 3 months.

## COMMENT

The school guidelines are developed for health and educational administrative departments, schools, CDCs, medical institutions (TB designated hospitals and other medical institutions), and primary health care facilities at all levels to engage in school TB prevention and control. It has more clearly defined the responsibilities of various departments and pointed out how to handle various problems in practice, which will

firmly guide the national school TB prevention and control work to be more standardized, prompt, and effective.

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