A 14-year-old girl died of tuberculosis – what should we do to educate contacts of contagious tuberculosis cases?

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Abstract

A 14-year-old girl was reported as a pulmonary tuberculosis (TB) case with bilateral cavitary lesions in early September 2007. She was dead on arrival at the hospital and was found to have 3+ bacteria on acid-fast stain. Although having regained vital signs after aggressive resuscitation, she died of multi-organ failure less than 4 days later. Her father was diagnosed with TB 6 years earlier, but had poor compliance with treatment. At that time, this girl received a tuberculin skin test (TST) during contact tracing. Because she had positive TST, a chest X-ray was also performed. Her chest X-ray was normal, and there was no further follow-up. This case came from lower socioeconomic status family. Therefore, despite having weight loss, weakness, and persistent cough, she was rarely seen by physicians. During her clinical visits, she did not mention that she

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had contact with tuberculosis patients, and the physicians also lacked awareness in suspecting TB.

Low socioeconomic status of the subject, insufficient public health education from the local public health authority, and poor awareness of the physicians examining her led to delayed diagnosis and eventual death of this girl. To resolve these longstanding problems, local health authorities need to have the ability to provide contacts of tuberculosis patients with information on risk of disease development. All caregivers of TB patients, including clinical and public health practitioners, need to understand the importance of contact tracing, in order to decrease the morbidity and mortality of TB.

Keywords: Mortality, public health education, contact, infectious tuberculosis patients

Foreword

All countries set treating active TB patients their first priority for tuberculosis (TB) control. Directly Observed Therapy-Short course (DOTS) program have shown to decrease mortality, transmission of disease, leading to decreased prevalence [1]. The incidence of TB, however, can show no profound decline over a short period through treating active TB cases alone. Strengthening contact tracing program to find undiagnosed active TB patients, screening for latent TB infected for more dynamic and aggressive treatment is a proactive approach to accelerate the decrease of TB incidence [2, 3]. In 2005, the TB incidence in Taiwan was 72.5 cases per 100,000 persons. Based on the outcomes of contact tracing, a conservative estimate of the TB incidence among contacts of confirmed TB cases is 2500~3000 per 100,000 TB patients (unpublished data), which is 35 times the incidence of the general population.

This indicates that if our local health authorities are willing to invest more resources into the examinations of TB contacts by close follow-up of high-risk groups, conducting all examinations listed in the contact tracing program thoroughly, providing correct health education to contacts and targeted treatment of latent tuberculosis infection, then we can expect that our goal of halving TB incidence in ten years can be reached [4].

Case Report

A fourteen-year girl, a third-grader of a junior high school, fainted in the bathroom at home and became unconscious on September 9, 2007. She was rushed to the emergency department of Medical Center A and appeared to be dead on arrival (DOA). After 15-minutes of resuscitation, the patient regained her vital signs. Through history, physical, and chest X-ray, the attending physician suspected that the girl had pulmonary TB with bilateral cavitary lesions in the lungs (Figure 1) complicated by respiration failure. After taking appropriate protective measures, the patient was transferred to Medical Center B for intensive care. Microscopy of her gastric fluid had 3+ of acid fast bacilli, while her CSF was normal. She was confirmed to have smear-positive TB. Even though she was put on anti-TB regimen which included oral and injectable drugs, she died of multi-organ failure less than four days after admission.

This patient was a member of the Atayal tribe. Her father was diagnosed and reported to have smear- and culture- positive tuberculosis in 2001. Between January and September of 2002, his mandatory therapeutic program was breached several times for a variety of reasons, and eventually he was treated at a municipal hospital. He completed treatment in May 2003. When the father was first diagnosed with TB, he had 4 contacts including his daughter, the case

described above. All contacts received chest X-ray as the standard procedure dictated. All X-ray images were normal. Because this girl was only 10 years-old at the time, she was also required to have tuberculin skin test (TST) as stipulated by "TB Prevention and Control Manual", which was positive. However, the TST result was not found in the TB database. The nurse who performed the TST indicated that hard copy the TST result was destroyed during a flood. Because of the positive TST, the girl was summoned back for repeat chest X-ray. According to the database, that checkup took place in April 2002. Because the contact follow up regulations at the time did not require repeat examination one year after, the health station had no further follow up of the girl.

In June 2007, the girl started to have fever and cough. The school nurse notified the girl's family and arranged for the girl to see a doctor at Clinic C. The physician diagnosed her with upper respiratory tract infection. Shortly after that, she revisited the clinic because of persistent cough. The doctor again diagnosed her with upper respiratory tract infection. She continued to be weak, underweight, and had poor appetite. However, she failed to follow up at the clinic because her family was behind in the health insurance premium payments. In August, she attended half-day summer school sessions at school. Because she weighed only 26 kilograms and appeared extremely tired and weak, a social worker was assisted in resolving the girl's insurance problem, and she went to Clinic D at the end of August. The diagnosis was also upper respiratory tract infection. Since her condition did not improve, she went to Medical Center A on September 8, 2007, one day before being rushed to the hospital, to see a cardiologist and an endocrinologist as an outpatient. Other than her electrocardiogram revealing sinus arrhythmia (heart rate: 130/min.), the center also took blood samples for serologic examinations (such as thyroid function test

and blood sugar), but did not do a chest X-ray. None of those specialists suspect her to be suffering from respiratory tract infection.

Three days after she was hospitalized, the Taiwan CDC branch office dispatched a mobile X-ray unit to the school attended by the sick girl to perform campus-wide contact screening. There were a total of 45 contacts at the school, including 34 classmates, 10 students at the summer school session, and her homeroom teacher. A total of 44 individuals were examined on that day; all had normal chest X-rays. They should all be followed-up in one year. The only absentee was a student who had already quit school. Other than contact-screening, the local health station arranged no education session for those examined, and did not intend to inform the contacts of their exposure. One of girl's classmate's parent was a physician. The day following the girl's admission to the hospital happened to be the school's Parents' Day. The school asked the doctor-parent to give health education to other students and parents. In addition, the case had 3 family contacts, her father, mother, and an elder sister. The mother was first detected and notified by Hospital E as a suspected TB case on September 26, 2007 because her chest X-ray showed cavities. However, she did not have her sputum examined immediately. After public health personnel contacted her, the mother did have her sputum examined and started treatment on October 8. The elder sister had chest X-ray on the same day as did her mother, and it was normal. Even though the father had completed TB treatment, he still needed to be followed up as a contact. He refused to be cooperative at the beginning, but finally consented on October 15. His chest X-ray showed no abnormal changes.

Furthermore, all those healthcare personnel working at Clinics C, D and Medical Center A had accidentally been exposed to the girl because they used no

respiratory protection. Following Taiwan CDC's instruction, the local health station asked the persons in charge of the two clinics and the infection control of the medical center for the names their own personnel who might have been exposed to the sick girl when she patronized the institutions. There were 20 people exposed. All clinic/hospital contacts have completed their first round of chest X-ray, and it is expected that they will be followed-up in the following year.

Discussion

Taiwan CDC clearly specified in it new version of "Guideline for TB Contact Tracing" promulgated on June 29, 2007 that whenever city or county health bureaus perform TB contact tracing, other than maintaining the confidentiality of every individual, health bureaus must also inform the contacts of the exposure and the risk of developing disease. It is expected that contacts will be aware of early symptoms, voluntarily inform their physicians of their contact history, to decrease delays in seeking care and diagnosis. However, it seemed that city and county health bureaus had not revised their standard procedure accordingly. They still only provide X-ray-checkup and failed to let contacts understand about the risks they are in and things they should watch out in the future. Ignorance of the disease led to fear among the students and parents.

It took 35 days before the girl's father accepted the mandatory contact examination. His wife should have come forward to be screened voluntarily. Instead, she was uncooperative at first, refusing to take drugs or have her sputum examined. Public health personnel should be more proactive in contacting diagnosing physicians and understanding the mother's disease, in order to provide assistance, such as home visits to collect sputum sample. When faced with uncooperative families, health station chiefs should intervene and persuade these

individuals. Health stations should also provide supervision of these families.

From the onset of respiratory tract symptoms to the girl's fainting and being rushed to the hospital, almost 3 months elapsed. She was also seen in clinics three times, each time being diagnosed as having upper respiratory tract infections. No physician suspected TB or referred to hospitals for further investigation. The day before the girl fainted, she was seen by two different specialists at a medical center. According to the medical record, the patient did not complain of cough or other respiratory tract symptoms. Therefore, even though the patient had significant weight loss, the doctors did not suspect TB. It is shown that even though the patient knew of her family exposure, she did not mention it to the attending physician, and the physicians were not alert enough to consider the possibility of TB. Out-patients less than 65 years of age with no hemoptysis are most likely to have delayed diagnosis of TB [5]. Therefore, in Taiwan, a TB middle prevalence country, tuberculosis need to be included as a differential diagnosis young patients present with severe weight loss with no or little cough [6]. Through contact tracing, we also reminded physicians who had seen the girl, letting them understand the importance of taking food history and have increased awareness of TB. This is most important way to curve TB deaths and avoid occupational exposure to TB.

As a contact, the little girl failed to voluntarily mention her contact history when being reviewed by the doctors at the clinics. This demonstrates that, public health education for family contacts and school contacts alike, there is room for improvement. This improvement may lead to earlier diagnosis and decrease severe disease and death [7]. Furthermore, we realize that patients and contacts of low socioeconomic status were often stripped of their rights to receive proper medical care. The girl was by malnourished compared to her classmates.

Although the school counselor provided assistance when needed, the girl still had more than one month without health insurance coverage because of financial difficulties. If the school were able to solicit assistance from social workers in tie, the delayed clinic visit might have been averted.

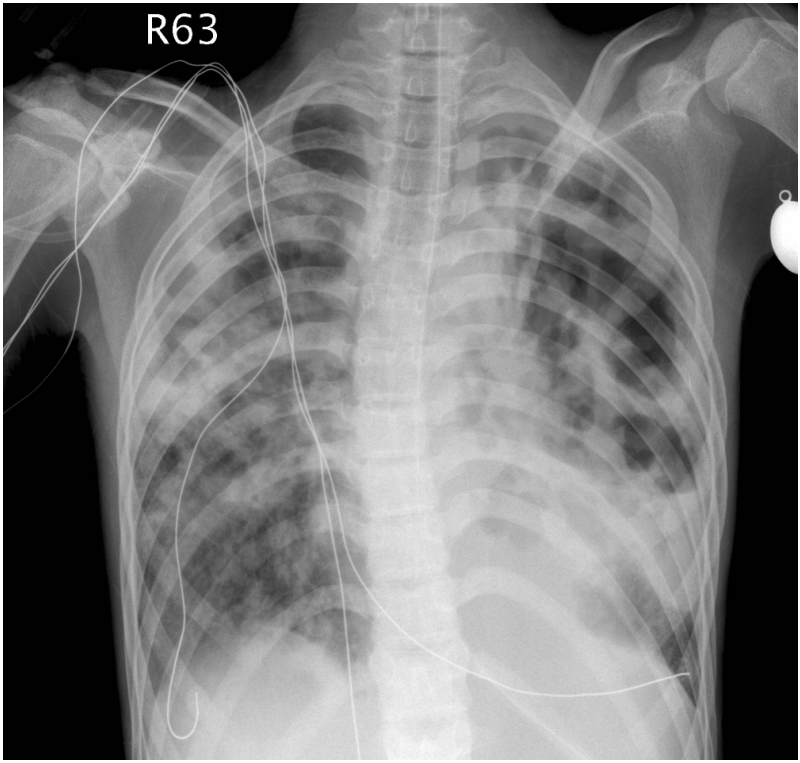
We found several important factors contributing to the unnecessary consequence. They include failing of doing a thorough job by the local public health team on contact tracing and letting the contacts understand the disease involved, the risk they are in, and be alert to it at key moments; socioeconomic issues; treatment completeness of the index case; and familiarity in diagnosing TB by physicians. All these factors can be improved. At the end of this article, we have attached a copy of "Examination Guideline for TB Contacts" and some control measures for TB cases in specific occupations or groups. These guidelines provide the basis for executing contract tracing and public health education. The guidelines should be executed in accordance to local cultural difference. Local health units should not decrease health education and campaign because of lack of personnel. This case showed that more than 3 years may elapse from infection to diseases. After the onset of symptoms, a variety of reasons led to delayed diagnosis and treatment, resulting in death. Because of this case, on September 29, 2007, Taiwan CDC re-issued a reminder to all local health stations asking them to make sure all contacts understand the risk of disease after exposure, hoping this will result in early suspicion and diagnosis of TB.

Conclusion

TB is still a prevalent in Taiwan. If the patient sough healthcare late because of low socioeconomic status or other reasons, or if the physician was not alert or had inadequate expertise, TB may still result in death. Through the case of this

14-year-old girl, we hope our public health personnel will wake up and proactively conduct contact tracing. We shall educate our physicians as well to detect TB cases as early as possible. Moreover, all individuals that have been listed as contacts by public health workers, whether they are family or school contact, they should be aware of all important items a contact needs to know, so that in case a contact becomes a patient later on, one would know to provide physicians with information for early diagnosis and treatment.

Fig 1. Multiple patches and cavitary lesions were evident over the bilateral lung fields, and consolidation over the left lower lung.



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