



Cough and fever in an immigrant adolescent with abnormal chest X-ray



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ABSTRACT

Tuberculosis (TB) remains a leading cause of death from infectious disease worldwide with 80,000 pediatric deaths annually. Disease caused by *Mycobacterium tuberculosis* (*Mtb*) is usually asymptomatic in pediatric patients and resolves after completion of standard therapy with isoniazid (INH). Rare reports document children greater than 10 years of age in endemic regions developing adult type cavitory disease, an infectious pulmonary tuberculosis lesion. This is a notable case of post-infectious pulmonary TB disease with adult type cavitation in an immigrant adolescent, which developed even after completing standard therapy with INH. With increasing immigration of refugees from endemic regions into the United States, the Center for Disease Control implemented standardized testing and treatment of TB. However even with identification of disease, many immigrants may not seek treatment or complete therapy given lack of health insurance, and poor access to health care. This case of a 14 year old adolescent with post primary cavitory TB highlights the importance of directly observed therapy (DOT) and medication compliance. Perhaps as noteworthy, this case also emphasizes the need for pediatricians to recognize the impact on public health and the potential for spread of active TB within schools and the community especially in pulmonary cavitory lesion.

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1. Introduction

Tuberculosis (TB) remains a leading cause of death from infectious disease worldwide with 80,000 pediatric deaths annually [1]. Commonly children develop tuberculosis after contact with an infected adult. Disease caused by *Mycobacterium tuberculosis* (*Mtb*) is usually asymptomatic in pediatric patients and resolves after completion of standard therapy [2–4]. Rare reports document children greater than 10 years of age in endemic regions developing adult type cavitory disease, an infectious pulmonary tuberculosis lesion [5]. With increasing immigration of refugees from endemic regions into the United States, the Center for Disease Control implemented standardized testing and treatment of TB. However even with identification of disease, many immigrants may not seek

treatment or complete therapy given lack of health insurance, and poor access to health care. The following case is an immigrant adolescent that completed therapy with Isoniazid (INH) for latent tuberculosis (LTBI) and developed a rare infectious post primary tuberculosis cavitory pulmonary lesion.

2. Case report

A Nepalese 14 year old adolescent female with history of treated LTBI presented to the emergency department (ED) with two weeks of non-productive cough and acute fever. The patient emigrated from southern Nepal two years prior with PPD induration of 11 mm, positive Interferon gamma release assay (IGRA) (Quantiferon-TB Gold in-tube test) of 9.55 IU/ml and negative chest radiograph. The patient completed a ten month course of INH and was asymptomatic until the start of this acute episode. Chart review documents patient reported compliance with INH during a TB follow-up visit, but there is no mention of directly observed therapy (DOT) or involvement of the local health department. She had no evidence of immunosuppression though was noted to have low vitamin D levels and growth along the fifth percentile. In the ED she was afebrile, tachycardiac, and tachypneic; she received fluid

Abbreviations: TB, Tuberculosis; *Mtb*, *Mycobacterium tuberculosis*; INH, Isoniazid; DOT, Directly Observed Therapy; LTBI, Latent Tuberculosis; IGRA, Interferon Gamma Release Assay.

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Fig. 1. Chest X-ray revealing ovoid lucency in left upper zone consistent with cavitary lesion.

resuscitation and antipyretics. CBC, CMP were unremarkable with negative blood culture. Chest X-ray demonstrated an ovoid lucency in left upper lobe measuring 1.6 cm by 1.7 cm concerning for post-infectious pneumatocele versus cavitary necrosis in a consolidation (Fig. 1). She received IV ceftriaxone and was admitted to the pediatric infectious disease service.

After further review, she was placed in airborne isolation with concern for TB. Physical exam noted a thin, well-appearing teen with decreased air exchange in the upper left lung field. Chest CT revealed a 2.4 cm cavitary lesion in the left upper lobe consistent with post-primary TB (Fig. 2). Repeat IGRA was positive. Sample was obtained from three consecutive daily gastric aspirates which grew *Mtb* pan-sensitive to Ethambutol, INH, Pyrazinamide, and Rifampin. Four drug therapy was initiated under direct observation of the health department and she was followed by the local pediatric infectious disease specialist. Repeat sputum acid fast smears were negative for mycobacterium and chest X-ray showed significant improvement upon completion of therapy (Fig. 3).

3. Discussion

Cavitary pulmonary TB is rarely seen in the pediatric population, even in countries with a high prevalence of TB. A study of 27 children with cavitary TB in India revealed it was more common in



Fig. 3. Chest X-ray demonstrating nearly complete resolution of previously noted air space disease in left upper zone.

female children secondary to poor nutrition and irregular drug therapy, children age 7–12 related to increased frequency of post primary disease during puberty and in those with contact with an adult with TB [6]. A South African report documents eight children ages 10–14, with sputum smear-positive disease with adult type cavitation on chest X-ray [5]. Our patient was less than the fifth percentile for height and weight, was pubertal, was not immunocompromised, resided with family members who emigrated from Nepal (including a sister treated for LTBI), had cavitary lesions on chest CT and sputum-smear positive disease all while residing in a developed country. This is a notable case of pan-sensitive sputum positive post-infectious pulmonary TB disease with adult type cavitation in an adolescent, which developed after completing standard therapy with INH.

This case raises multiple questions regarding pediatric TB and necessitates discussion for directly observed drug therapy. The patient above reported compliance with INH therapy despite lacking documentation of DOT or involvement of the health department. Does DOT and involvement of the health department make a difference in patient compliance? Or is routine follow-up



Fig. 2. Chest CT confirming cavitary lesion in left upper lobe consistent with post primary tuberculosis.

with a TB clinic or infectious disease specialist enough? Studies show greater treatment compliance, as high as 90%, with a patient centered approach using DOT [4]. In our case the patient was discharged from the hospital with DOT by the local health department who documented subsequent sputum cultures were negative after treatment. Follow-up with infectious disease specialist documents patient compliance, monitored drug side effects and demonstrated nearly complete resolution of cavitory lesion on repeat chest X-ray. Clearly involvement of the local health department and infectious disease experts provides reassuring evidence and a greater level of confidence for disease clearance.

If the patient in the above case was compliant with INH therapy and proceeded to develop post-primary cavitory TB, physicians must reconsider the rarity of INH resistant TB in the pediatric population. Isoniazid is extremely effective in the treatment of LTBI and use is implicated to help prevent reactivation of pulmonary disease [7]. With excellent adherence to medication, INH therapy of LTBI is close to 100% effective to prevent future disease [8,9]. In such a case, one must question if this patient developed an INH-resistant strain of *Mtb* (which is unlikely since sputum cultures were sensitive to INH), or if the patient was truly compliant with INH therapy.

With more patients emigrating from countries with high prevalence of TB, there is likelihood of increasing number of pediatric cases of infectious TB in the developed countries. Pediatricians must be concerned for TB in a patient presenting with prolonged cough, fever, and constitutional symptoms – with heightened awareness in foreign born populations. Pediatricians must especially recognize radiologic findings concerning for TB including cavitory lesions and lymphadenopathy. If there is concern for TB, appropriate isolation protocol must be put into action immediately to prevent undue transmission of disease. Physicians must recognize the impact on public health and the potential for spread of active TB within schools and the community especially in pulmonary cavitory lesion.

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Conflict of interest

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