Case report

Multibacillary, cavitary tuberculosis in an immunocompetent child perpetuating to family members - A Case Report

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Abstract

Cavitary tuberculosis in the immunocompetent paediatric age group is not a common occurrence. The cavitary condition of the disease relates to a high bacillary load and such patients are highly infectious. If not treated early, it can cause perpetuation of infection to close contacts in the family who also can eventually turn positive for tuberculosis (TB).

Here is a case of an eleven –year- old girl with a history of cough for 2 months present throughout the day, associated with yellowish, non-blood-tinged sputum, fever and chills. The Ziehl Neelson stain revealed acid fast bacilli 3+. Sputum culture by MB/BacT automated system flagged positive on day 12. The MPT64 antigen test confirmed *Mycobacterium tuberculosis*. The PPD skin test was significantly positive in family members. The child improved with antitubercular treatment and her family members were negative for AFB and chest X-ray findings.

Open cases of tuberculosis with cavitary lesions in the paediatric age group need to be recognized early with a high index of clinical suspicion and treated along with contact tracing of close contacts.

Keywords: *Multibacillary, paediatric, Tuberculosis, Cavitary*

Introduction

The global epidemiology of paediatric tuberculosis is not clearly described, as many cases go undiagnosed. Paediatric cases range from 20-40% of total TB cases in high burden areas and 3-4 % in low burden areas.[1,2] Untreated infants with latent tubercular infection have the likelihood of developing full blown tuberculosis in up to 40% of cases and detection of such cases becomes still

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more difficult.[2] Once infected, risk of progression is greatest in the first 2 years. More than 50% of children with X- ray findings of moderate to severe TB have no clinical signs or symptoms and are discovered by contact tracing.[3]

Case Report

An eleven-year-old schoolgirl presented to the paediatric outpatient department with a history of cough, persisting throughout the day for 2 months, associated with scanty, yellowish, non-foul smelling, non-blood-tinged sputum. Her parents informed that she also had intermittent fever with chills and rigors.

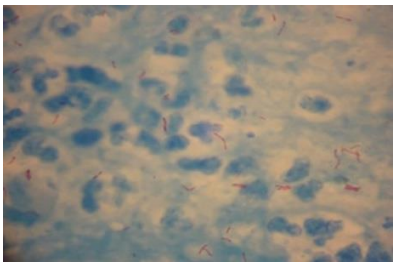


Figure 1. Ziehl Neelson staining of sputum sample

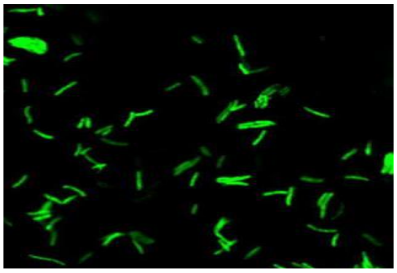


Figure 2. Fluorescent staining

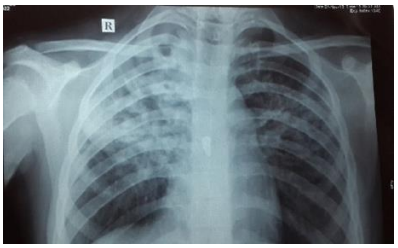


Figure 3. Chest X-ray PA view

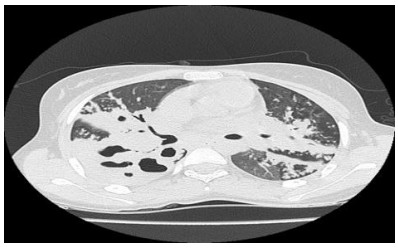


Figure 4. HRCT Thorax

There was no history of similar complaints in other members of the family. She had been immunised age appropriately including BCG and had attained all milestones to date.

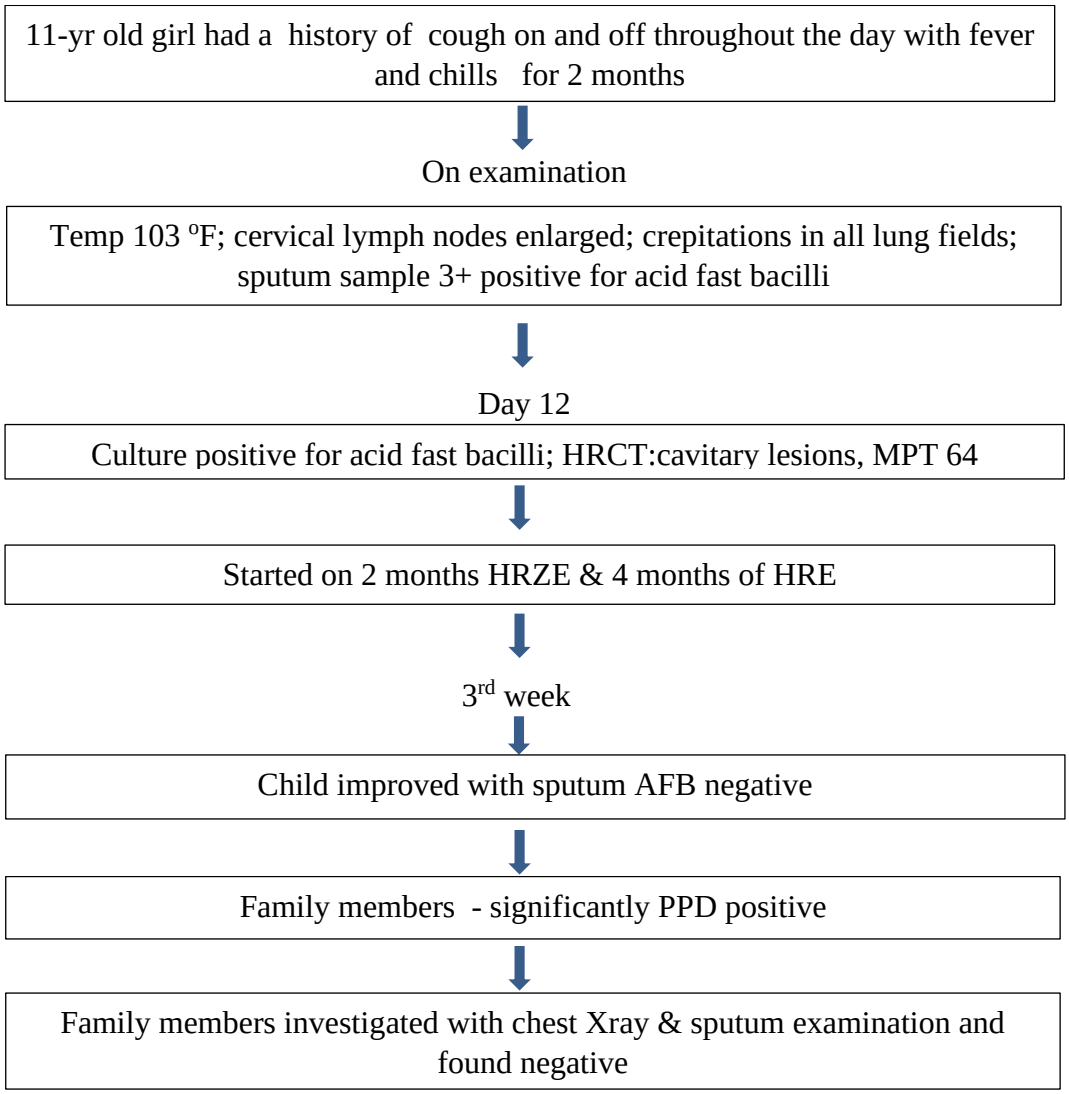
On admission her weight was 30.5 kg with a 2 kg weight loss in the past 3 months. Her axillary temperature was 103 ^{o}F, pulse rate was 88 beats/minute regular with good volume, and blood pressure was 112/60mmHg. She was pale and had significantly enlarged cervical lymph nodes. On auscultation, fine crepitations were heard in almost all the lung fields. Other systems were within normal.

Laboratory investigations revealed haemoglobin of 9.4g%, total white cell count of 12600 (neutrophils 76%, lymphocytes 22%), ESR 150mm/hr, platelets 5.06 x10^3 per µl, packed cell volume 30.2%. and C Reactive protein 47.60. Her HIV status was non-reactive. Her early morning sputum was sent for Gram staining which showed a significant number of inflammatory cells, Gram positive cocci in pairs, clusters and Gram negative bacilli. Ziehl Neelson (ZN) and fluorescent stain showed 3+AFB (Figures 1, 2)

Sputum culture by MB BacT automated system flagged positive on 12th day of incubation. It was sensitive to rifampicin, isoniazid, streptomycin, and ethambutol. Chest X ray (Figure 3) and High-Resolution Computed Tomography (HRCT) (Figure 4) of thorax revealed patchy areas of air space opacifications containing air bronchograms, cavitating lesions and fluffy nodular shadows involving both the lungs, mainly in the upper and mid zones. MPT 64 antigen test was positive confirming the isolate as *Mycobacterium tuberculosis.* Diagnosis of cavitary pulmonary tuberculosis was made. Family members were significantly PPD positive (father 44mm; mother 36mm; brother 27mm).

The child was started on isoniazid(H), rifampicin (R), pyrazinamide(Z) and ethambutol(E) daily for 2 months followed by 4 months of HRE. The patient improved significantly with negative sputum culture in the 3rd week of treatment,. Monthly

evaluation of sputum acid fast smear staining was negative and sputum culture revealed no growth of MTB from the end of the first month till the 12th month of evaluation. Laboratory results for monitoring the adverse effects and side effects of the drugs showed normal results for serum electrolytes, renal and liver function tests. Family members were further investigated with detailed history and chest x-ray. However, chest x-ray findings were insignificant and sputum AFB negative.



(HRCT: High resolution Computerised Tomography, H-Isoniazid, R- Rifampicin, Z- Pyrazinamide, E- Ethambutol, PPD- Purified protein derivative)

Figure 5: Timeline

Discussion:

According to the 2019 India TB Report, the burden of TB was 6.66% in the age group of 10-14 years of whom 4.82% were females and 1.84% were males. Usually, malnourished children are at risk of developing the disease, especially if they are exposed to a person with smear positive tuberculosis in the household. Other risk factors are age < 5 years and immunocompromised status. In this case, the child does not fit into any of these categories. Children once infected develop

tuberculosis within 2 years of exposure. A small number of older children develop TB later, either due to reactivation or because of reinfection. In infancy and childhood age groups, TB is generally characterized by hilar lymphadenopathy and parenchymal changes in the lung. Accompanying cavitary lesions are rare.[4]

The age range 5-14 years is called 'favoured age' as this group has the lowest rate of development of tuberculosis.[3] Progression from latent tuberculosis to active disease is very rapid in case of children <1 year. It occurs even before the tuberculin skin test becomes positive. The number of bacilli causing disease in children tends to be low and the 'paucibacillary' nature of their disease compromises diagnostic yield.[5] Generally, pulmonary tuberculosis with cavities is seen in adults. In the paediatric age group, it is seen particularly in immunocompromised individuals.[6] It has been shown that cavitary pulmonary TB is more frequently seen in females than in males between the ages of 14-17 years[7,8] because of increased frequency of post primary disease during puberty.[9]

Smaller children are unable to produce sputum and tend to swallow the little amount of sputum produced. Hence a sample of gastric lavage should be collected for 3 consecutive nights early in the morning after overnight fasting.[2] This procedure may be quite uncomfortable to the patient. Studies have shown that only 10-15% of sputum smears reveal acid fast bacilli and cultures remain negative in 70% cases.[6] Hence confirmation of diagnosis by sputum smear examination is an exception rather than the rule. The paucibacillary nature of sputum limits the microbiologic confirmation of the disease. Newer molecular methods and culture are positive in <25–40% of children with TB disease.[10,11] Cavitation from exogenous infection is more in countries like India where there is increased incidence of tuberculosis.[12] Young children lack tussive force required to suspend infective particles. However, older children with cavitating lesions can transmit the bacilli by droplet transmission.[3] This may pose a threat of persistence of infection in the community.

A household contact is the major source of infection in young children whereas older children may be infected by an external contact in schools, buses, or playgrounds, as in this case. As the patient in this case report was sputum smear positive with a cavitating lesion, she in turn could have possibly infected her household contacts, who also turned out to be PPD positive. Early and prompt treatment of childhood tuberculosis is essential, as chances of progression to disseminated tuberculosis is high. At the same time investigating and treating exposed family members if required and contact tracing of close contacts is of utmost importance.

Conclusion

Identified cases of paediatric tuberculosis are only the tip of the iceberg**.** As the presentations are not as pronounced as in adult tuberculosis and due to the paucibacillary nature of the infection, cases often go unrecognized. Cavitating lesions and sputum positivity have been documented in children with tuberculosis as rare occurrences. An open case of paediatric TB should be considered a potent source for spread of infection as in this case, and contact tracing and screening of exposed individuals is imperative. The true burden of disease is unveiled only with a high degree of clinical acumen aided by laboratory diagnosis.

Declarations

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