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Value of tuberculin skin testing and chest x-ray in tuberculosis intensive case finding amongst HIV-infected children

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Background

- Diagnosis of active TB infection in HIV-infected children remains a challenge
- Clinicians are forced to rely on clinical diagnosis due to:
  - Lack of availability of molecular diagnostics and sputum microscopy and culture
  - Lack sensitivity of TB diagnostics in children
- Tuberculin skin testing (TST) and chest radiography (CXR) are tools that may complement diagnosis of TB in HIV-infected children

Objective

- To assess the usefulness of chest radiography and TST in the detection of TB in children

TB in Kenya

- 150,000-200,000 HIV-infected children in Kenya
- Up to 20% may become co-infected with TB without intervention
- Kenya is the 13th of the 22 highest TB burden countries in the world
- 10-15% of cases are children <15yrs of age

Methods

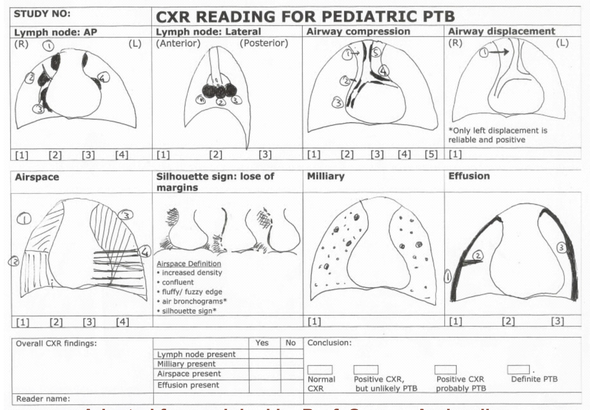
- Prospective cohort study evaluating prevalence/incidence of TB
- HIV-infected children age 6 weeks-14 years were included

  All children actively screened for Pulmonary TB (PTB) using Kenyan TB score chart, CXR and TST regardless of symptoms
- March 2009-December 2010
- 2 Family AIDS Care and Education Services (FACES)-supported clinics in Nairobi and Kisumu and New Nyanza Provincial General Hospital

TB diagnosis

- TB was diagnosed clinically per Kenya National Guidelines using a modified Keith Edwards score chart
- Training on radiograph interpretation using a standardized reading form was provided
- Participants were given 0.1mL of 5TU of purified protein derivative intradermally on the dorsal surface of the forearm
- Induration was measured after 48 -72 hours. A positive TST was defined as >5mm

TST photos



Adapted from original by Prof. Savvas Andronikou

TB Score Chart

FEATURES	SCORE
Positive smear	7
Tubercle in biopsy	7
Contact with person suspected or confirmed TB	2
Tuberculin test results equal or more than 15mm **(>5mm HIV-infected)**	3
Enlarged painless lymph node +/- sinus present	3
Night sweats, unexplained fever, no response to anti-malarial	2
Abnormal CXR	2
Malnutrition not improving with 4 weeks of treatment	3
Angle deformity of the spine	4
Firm non fluid, non traumatic joint swelling	3
Unexplained abdominal swelling or ascites	3
Change in temperament, convulsions, or coma lasting ≥ 48	3
Less than 2yrs	1
BCG vaccination given	-1
Total	

- Scores interpretation was as follows:
  - >7 definite TB
  - 5-6 probable TB
  - 3-4 further investigation needed
  - <2 unlikely TB
- Abnormal CXR = 2 points
- Positive TST = 3 points

Analysis

- Analysis was performed using dichotomous tables and calculation of sensitivity and specificity using TB score ≥7 as the proxy gold standard

Results

- A total of 690 HIV-infected children, median age of 6.4 years, (IQR 4.0 – 9.5) were assessed
- 65 (9%) were diagnosed with PTB
- 274/663 (41%) children with CXR results had an abnormal CXR
- 104 (15%) children were TST positive
- For those with a positive TST, the average induration was 13.9mm (5-25mm)

Table 1. Sensitivity analysis of CXR and TST in diagnosing TB

	Sensitivity	Specificity	NPV
CXR	80.0%	63.0%	97.0%
TST Positive	38.0%	87.0%	93.0%
Sequential testing: TST positive with abnormal CXR	89.0%	54.0%	-

Potentially missed cases without CXR and TST

- Using a TB score cut-off of at least 5:
  - 25 cases (38%) would have been missed without CXR,
  - 26 cases (40%) would have been missed without TST
  - 39 cases (60%) would have been missed without both CXR and TST

Conclusion

- Use of CXR contributes substantially to diagnosis of PTB in this sub-population
- Although TST is not sensitive it also assists in identifying children who may be infected with PTB
- The sensitivity of these tests can be optimized through sequential testing considering those positive for TST to undergo CXR especially in resource limited settings without easy access to radiography but where implementation of TST would be feasible
- More research on such an approach may improve identification of TB in HIV-infected children

Limitations

- Small sample size
- Clinical diagnosis of PTB

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