

Evaluation of the WHO algorithm for TB screening in HIV-infected children



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Background

- The optimal approach to screening HIV-infected infants and children for pulmonary tuberculosis (TB) remains uncertain
- Current World Health Organization (WHO) guidelines recommend a symptom-based screening approach to exclude active TB and identify those in need of further investigation

Objectives

- To describe the performance of the WHO algorithms to exclude or diagnose TB using clinical diagnosis as the proxy gold standard

TB in Kenya

- 13th of the 22 highest TB burden countries in the world
- 10-15% of cases are children <15 yrs of age
- 44% overall HIV co-infection rate among TB cases (69% Nyanza Province)

Method

- A prospective cohort study was conducted between 2009-2010 at three Family AIDS Care and Education Services (FACES) supported sites in Kisumu and Nairobi, Kenya
- FACES is a PEPFAR-funded comprehensive HIV prevention, care and treatment program based primarily in Nyanza Province Kenya
- TB was diagnosed using the Kenya TB Programme 2008 TB diagnostic guidelines for children
- TB evaluation included symptom screen (clinical history), physical exam, CXR, tuberculin skin test (TST) and scoring using a modified Keith Edwards score chart
- TB cases were used to determine specificity, sensitivity, negative predictive value (NPV) and positive predictive value (PPV) of the WHO algorithms

Kenya TB Programme Diagnosis 2008

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	

INTERPRETATION:

- ≥ 7 : definitely TB
- 5-6: TB probable, may justify treatment
- 3-4: TB possible, requires further investigations
- ≤ 2 : TB unlikely

WHO TB Screening Algorithms 2010

Unlikely to have TB

- Children living with HIV who DO NOT have
 - Poor weight gain
 - Fever
 - Current cough

May have TB

- Children living with HIV who have ANY ONE of the following
 - Poor weight gain
 - Fever
 - Current cough
 - Contact history with TB

WHO. Guidelines for intensified tuberculosis case-finding and isoniazid preventive therapy for people living with HIV in resource constrained settings. Geneva, Switzerland. 2011.

Results

- Of the 690 HIV-infected children screened for TB with a median age of 6.4 years, (IQR 4.0–9.5), 65 (9%) were diagnosed with TB
- The WHO screen to rule out TB had a sensitivity of 78.5% and NPV of 95.0%
- The WHO screen for possible TB had a sensitivity of 87.7% and specificity of 38.2%, PPV 12.9%
- Adding TST and replacing cough of any duration with cough >2 weeks did not significantly alter the performance of the positive screening algorithm
- Addition of an abnormal chest radiograph led to an increased sensitivity of 95.4% and specificity of 34.7%

Table 1. PTB cases compared to WHO Algorithms

Screen	TB	NO
WHO Rule out TB	YES	NO
Positive on 1 or more	51	362
Negative on all	14	263
WHO Possible TB		
Positive on 1 or more	57	386
Negative on all	8	239
Add TST		
Positive on 1 or more	57	386
Negative on all	8	239
Add CXR		
Positive on 1 or more	62	408
Negative on all	3	217

Table 2. Sensitivity analysis of WHO algorithms

	Sensitivity	Specificity	PPV	NPV
WHO rule out TB	78.5%	42.1%	12.4%	95.0%
WHO possible TB	87.7%	38.2%	12.9%	96.76%
Add TST	87.7%	38.2%	12.9%	96.8%
Add CXR	95.4%	34.7%	13.2%	98.6%

Conclusion

- These results show that the WHO screening algorithms perform well for excluding TB
- However, the WHO approach shows poor specificity and low PPV for diagnosing cases of TB
- Limited access to chest radiograph and poor performance of TST and sputum testing present serious barriers to improved TB diagnosis in HIV-infected children in low resource settings

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