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Ranking of diagnostic features of childhood pulmonary tuberculosis by medical doctors in southeastern Nigeria

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Abstract*Objective*: To rank diagnostic features of childhood pulmonary tuberculosis; and to determine the effect of working in tuberculosis Directly Observed Treatment Short Course (DOTS) facilities on the ranking of these features by medical doctors.
Methods: A cross sectional descriptive study, using structured questionnaires to collect data from medical doctors whose daily routine included attending to sick children in 34 selected children outpatient clinics and TB DOTS centers in southeastern Nigeria.
Results: Approximately, one quarter (25.3% or 56 of 221) of respondents worked in Directly Observed Treatment Short course (DOTS) clinics, while three quarters (74.7% or 165 of 221) worked in non DOTS clinics.
Majority of the respondents (69.7%) ranked chronic persistent cough (1), 42.5 % ranked weight loss and failure to thrive (2), another 27.7% ranked weight loss and failure to thrive (3), while 17.6% and 21.7% ranked History of contact with adult index case and radiographic abnormalities, (4) and (5), respectively.
The study found that the percentage of doctors working in DOTS clinics who ranked weight loss and failure to thrive (2) was statistically and significantly higher than those of non-DOTS respondents.
Conclusions: The most important symptoms/signs on which medical doctors based their diagnosis of childhood pulmonary tuberculosis include cough, weight loss and failure to thrive, history of contact with adult with smear positive pulmonary tuberculosis, and radiographic abnormalities consistent with active tuberculosis. There was statistically significant difference between the ranking of weight loss and failure to thrive by doctors working in DOTS clinics and their counterparts in non DOTS clinics. This study showed a decline in the percentage of ranking in both DOTS and Non DOTS respondents as they moved from the first to the fifth.

KEY WORDS: Childhood pulmonary tuberculosis, Doctors, Ranking, Diagnostic features, Directly observed treatment short course (DOTS).

Introduction

Reduction of childhood mortality is one of the Millennium Development Goals (MDGs) by the world community to be achieved by the year 2015 [1]. Morbidity and mortality from childhood tuberculosis have increased due to the emergence of HIV/TB co-morbidity [2]. This has further compounded the diagnostic challenges of childhood tuberculosis. Younger children are unable to expectorate sputum for smear microscopic examination and when they do it has been found to be pauci-bacillary even in those who have childhood pulmonary tuberculosis [3]. For instance, *Zar etal.* found that sputum smear microscopy was positive in less than 10 to 15 % of children

with probable tuberculosis[4]. Similarly, low culture yields of 30 to 40% have been reported in children with probable tuberculosis [4,5].

Broncho-alveolar lavage and nasopharyngeal aspirates are unavailable in resource poor TB endemic areas, are expensive and give low yield [6]. It is therefore difficult to base child hood pulmonary TB diagnosis on any definitive reference or gold standard (bacteriological confirmation) [7].

The diagnosis of childhood tuberculosis in non-endemic areas is usually based on the triad of history of contact with an adult index case, positive tuberculin skin test (TST), and suggestive signs on chest radiograph. These risk factors provide fairly accurate diagnosis in settings where exposure to mycobacterium tuberculosis is rare. However, in endemic areas where exposure to *M. tuberculosis* is common; the accuracy of the triad is reduced as exposure frequently occurs outside the household [8, 9]. Randomly selected healthy children in endemic areas were found to have tested positive to TST [10]. Thus limiting the diagnostic value of TST, and strengthening the suggestion that clinical features and chest radiograph should be used for the diagnosis of tuberculosis in children in endemic areas [11, 12].

Various clinical scoring systems have been developed over the years to improve the diagnosis of childhood pulmonary tuberculosis. However, reviewers have criticized them as being limited by a lack of standard symptom definitions and adequate validation [13,14]. World Health Organisation (WHO) recommended an approach to diagnosis of tuberculosis in children based on the use of a modified scoring system for children under 15 years that includes chronic cough (>2 weeks), fever, night sweats, failure to thrive, anorexia, weight loss, history of contact with adults with smear-positive pulmonary pulmonary tuberculosis, no response to standard broad-spectrum antibiotic treatment, one or more sputum smear positive for acid-fast bacilli, culture positive for *Mycobacterium*, and/or radiographic abnormalities consistent with active TB [15]. A score of ≥5 triggers TB treatment initiation.

According to Marais et al, symptoms could offer good diagnostic value if they were well defined [16]. They suggested that pulmonary tuberculosis could be diagnosed in HIV-uninfected children using a simple symptom-based approach, particularly in resource-limited settings where current access to antituberculosis treatment was poor.

In another study Marais et al observed that 3 well-defined symptoms at presentation (persistent, non remitting cough of less than 2 weeks' duration; objective weight loss [documented failure to thrive] of 3 months duration in HIV-uninfected children less Than 3 years of age and reported fatigue) could be relied upon to make a diagnosis of PTB in children ≥3 while this was not exactly the case with children < 3 years [17]. They observed that the presence of a persistent, non remitting cough together with documented failure to thrive still provided a fairly accurate diagnosis.

They observed that the use of well defined symptoms as diagnostic tool, even in resource limited settings, may improve the chances of diagnosing childhood pulmonary tuberculosis. Fourie et al observed some clinical criteria thought to be most relevant as predictors of tuberculosis in children [18]. These criteria include history of contact with a case of tuberculosis, positive skin test, persistent cough, low weight for age, and unexplained/ prolonged fever. They noted that the criteria for high prevalence setting include case contact and skin tests which were less important, while low body weight, prolonged fever and cough were more indicative of tuberculosis.

This study, therefore, intended to discover the diagnostic features on which medical doctors based their diagnosis of childhood PTB and how they ranked them in resource poor and TB endemic settings.

Subjects and Methods

This cross sectional descriptive study was conducted among fully licensed medical doctors whose practice routine included providing clinical care services to children in 34 selected private and public health institutions in the southeastern zone of Nigeria (Abia, Anambra, Ebonyi, Enugu, and Imo States). The 34 hospitals were selected from over 181 health facilities that provided tuberculosis directly observed treatment short cut (TB-DOTS) services.

The selected health facilities were those that had medical doctors in their employment (e.g. teaching hospitals, specialist hospitals, state general hospitals, faith based or mission hospitals and some private hospitals) and had both children outpatient clinics (Non DOTS clinics) and TB -DOTS clinics, Two hundred and thirty (230) consecutive doctors working in the children outpatient (Non DOTS clinics) and TB- DOTS clinics of the selected health facilities between August and November 2011 and who consented were recruited for the study and were required to fill self administered structured questionnaire.

A list of WHO recommended standard features of tuberculosis was provided and respondents were

asked to rank the features as 1, 2, 3, 4, and 5 in descending order of preference. Other questions asked were number of years of practice, area of specialization, location of practice, minimum number of children consulted in a typical day, and indication as to working in a TB-DOTS centre. Two hundred and twenty three completed questionnaires were collected by five trained research assistants and the data were analysed using SPSS for windows version 15.

Descriptive statistics such as means, frequency distribution, and standard deviation were used to describe the findings. The level of statistical significance was set at p= 0.05 (95% confidence interval)

Result

A total of 230 questionnaires were distributed to the subject, and 223 were returned. Two hundred and twenty one questionnaires were analyzed after rejecting two that were found to be incomplete.

Respondents from Anambra state were 36.7% or 81 of 221, while 26.2% or 58 of 221 were from Abia state, and 17.2% or 38 of 221 were from Imo state. Others included 15.4% or 34 of 221 from Enugu state and 4.5% or 10 of 221 were from Ebonyi state. Majority of the respondents were in General practice (56% or 124 of 221), while 37.1% or 82 of 221 were in paediatrics and 6.8% or 15 of 221 were in Family practice.

There is a male: female sex-ratio of 3.4:1.0. The mean age of the males (mean ± SD) 40.6 ± 10.43 years, was statistically significantly older than the females 25.9 ± 8.2 years (t = 2.938, P = 0.004), while 80% of the females were less than 40 years of age, only 56% of the males were in that category.
Approximately, one quarter (25.3%) of respondents worked in DOTS facilities, while about three quarters worked in non DOTS clinics

Table 1 shows that chronic persistent cough was ranked first by 69.7%, followed by weight loss or failure to thrive rated second by 42.5%.

A comparison of the ranking of respondents in DOTS and non DOTS centers showed the following;

Table 1: The distribution of Symptoms of TB on a 5 level ranking scale by the doctors

Diagnostic features	Ranking (n %)				
	1	2	3	4	5
Chronic cough	154(69.7)	26(11.8)	9(4.1)	9(4.1)	6(2.7)
Weight loss/failure to thrive	27(12.2)	94(42.5)	60(27.1)	28(12.7)	17(7.7)
Fever	20 (9.0)	48(21.7)	33(14.9)	27(12.2)	15(6.8)
Radiographic abnormalities consistent with active TB	4(1.8)	8(3.6)	21(9.5)	24(10.9)	48(21.7)
Hx of contact with adults with smear positive PTB	3(1.4)	20(9.0)	46(20.8)	39(17.6)	25(11.3)
Night sweats	1(.5)	3(1.4)	10(4.5)	19(8.6)	16(17.2)
Sputum smear positive for AFB	3(1.4)	4(1.8)	6(2.7)	17(7.7)	13(5.9)
TB skin test	2(0.9)	-	2(0.96)	10(4.5)	14(6.3)
Others	7(3.2)	16 (7.3)	31 (14.2)	42 (19.1)	37 (16.8)
Total	221(100)	219(99.1)	218(98.6)	215(97.3)	192(86.9)

Table 2: Ranking of five most important diagnostic features by respondents in DOTS and Non DOTS centers

TB/DOT	Ranking n (%)						
	1	2	3	4	5	Total	P-value
Cough							
Yes	36 (64.3)	7 (12.5)	3 (5.4)	4 (7.1)	2 (3.6)	56	0.62
No	118 (71.5)	18 (10.9)	6 (3.6)	5 (3.0)	4 (2.4)	165	
Weight loss/ failure to thrive							
Yes	6 (10.7)	27 (48.2)	14 (25.0)	2 (3.6)	7 (12.5)	56	0.07
No	21 (7.86)	67 (40.6)	42 (25.5)	19 (11.5)	6 (3.6)	165	
Fever							
Yes	4 (7.1)	6 (10.7)	9 (16.1)	5 (8.9)	4 (7.1)	56	0.51
No	16 (9.7)	42 (25.5)	24 (14.6)	22 (13.3)	11 (6.7)	165	
History of contact with adult TB cases							
Yes	2 (3.6)	4 (7.1)	11 (19.6)	8 (14.3)	6 (10.7)	56	0.48
No	1 (0.6)	16 (9.7)	35 (21.2)	31 (18.8)	19 (11.5)	165	
Radiographic abnormalities							
Yes	0 (0.0)	2 (3.6)	6 (10.7)	6 (10.7)	11 (19.6)	56	0.82
No	4 (2.4)	6 (3.6)	15 (9.1)	18 (10.9)	37 (22.4)	165	

First Ranking: A higher percentage of respondents in non DOTS clinics ranked chronic cough (71.5%) as first compared to respondents in DOTS clinics (64.3%). This difference was not statistically significant (p. value > 0.05)

Second Ranking: A lower percentage (40.6%) of Non DOTS respondents ranked weight loss/ failure to thrive second compared to the higher percentage of respondents in DOTS clinics (48.2%). This difference was statistically significant (p. value < 0.05)

Third Ranking: Respondents from non DOTS (14.6%) clinics ranked Fever as third compared to DOTS clinics respondents (16.1%) . The difference was not statistically significant (p. value > 0.05)

Fourth Ranking: History of contact with adults with smear positive pulmonary tuberculosis was ranked as fourth by respondents, who worked in non DOTS clinics (18.8%), compared to those in DOTS clinics (14.3%). The difference was not statistically significant (p. value > 0.05)

Fifth Ranking: Approximately, one quarter of respondents in non DOTS clinics (22.4%) ranked Radiographic abnormalities fifth compared with one fifth (19.6%) of respondents in DOTS clinics. The difference was not statistically significant (p. value > 0.05)

Discussion

The ranking of the diagnostic features observed in this study agree with the recommended approach of Modified scoring system by WHO, however, this study went further to rank the diagnostic features in accordance with their perceived preference in the diagnosis of child hood pulmonary TB. The possible implication of these findings was that such common symptoms as chest pain, haemoptysis, dyspnoea, breathlessness were not perceived as prime symptoms in childhood pulmonary tuberculosis by respondents. Although, no study ranking symptoms could be found during literature review, Fourie et al18 observed that five clinical criteria including history of contact with a case of tuberculosis, positive skin test, persistent cough, low body weight for age and unexplained /prolonged fever were most relevant as predictors of pulmonary TB in children.

They found that low body weight, prolonged fever and cough were more indicative of tuberculosis in children. The findings in this study were similar to those of Fourier et al, 18 except that the positive tuberculin skin test low rating was probably due to perceived poor yield caused by the presence of non-tuberculous mycobacteria species, routine BCG vaccine to children and poor reaction to tuberculo-protein in malnourished children in this setting. The finding in this study is relevant to the diagnosis of pulmonary tuberculosis in resource poor and TB endemic setting where the TB case finding has become problematic.

The pattern of ranking of symptoms by those working in DOTS centre was statistically significant from those working in non DOTS centre in the ranking of weight loss/ failure to thrive (p. value < 0.05). This pattern tended to suggest that weight loss and failure to thrive was rated higher in the diagnosis of child hood pulmonary tuberculosis

By doctors working in DOTS clinics than their counterparts from the non DOTS clinics. It is probably because weight loss and failure to thrive have become a regular feature observed by doctors in the DOTS clinics during the diagnosis of childhood pulmonary TB. Weight gain was usually, seen to be the first indication of recovery during treatment. This finding underlines the perceived importance of weight loss in the diagnosis of childhood pulmonary tuberculosis and the need for weight monitoring in detecting early childhood pulmonary TB. Similar observation was made by Marais et al who found that the combination of cough and weight loss was more significant than other individual symptoms such as dyspnoea, chest pain, haemoptysis, anorexia, fatigue, fever, night sweats [19].

This study showed a decline in the percentage of ranking in both DOTS and Non DOTS respondents

As they moved from the first to the fifth. This decline probably indicated that there was a falling confidence among the doctors as the ranking moved down from chronic persistent cough to finding radiographic abnormalities in the lung fields. The implication is that the first three features represented the mostly rated clinical approach to childhood pulmonary tuberculosis and could be used to improve the clinical case findings of childhood pulmonary tuberculosis if more doctors attending to children are trained on the use of this approach.

This study has shown that the majority of doctors in the study area used the recommended diagnostic approach in the diagnosis of childhood pulmonary TB. It has revealed the need for improvement in the diagnostic skills, possibly through training and regular workshops for all doctors in the care of sick children. The authors believe that an improved case finding of child hood tuberculosis would lead to better TB control in the study areas.

Conclusion

The five most important diagnostic features on which medical doctors based their diagnosis of childhood pulmonary tuberculosis include (in descending order); chronic persistent cough, weight loss/ failure to thrive, history of contact with adult with smear positive pulmonary tuberculosis, and radiographic abnormalities consistent with active tuberculosis. The three prime diagnostic features were chronic persistent cough, weight loss/failure tothrive and fever. The respondents working in TB-DOTS and their colleagues in the Non DOTS centers differed significantly in their rating of weight loss/ failure to thrive.

Contributors

Nnaji GA Research Coordinator, development of the research topic and proposal, conducting literature review and leading the report writing

Chukwu JN - Theoretical conceptual phase development, reviewing the proposal and the draft copy of the manuscript, assisting in securing funding.

Ezechukwu CC -Providing technical advice, reviewing the draft copy of the manuscript, Assisting in the training of Research assistants.

Ugochukwu EF- contribution to the discussion, reviewing and rewriting of the report and the manuscript for consistency.

Ogbonnaya L Reviewing the proposal, contributions to the theoretical conceptual phase of the study

Ogbuabor DC - contribution to the research conceptual theoretical phase and review of the draft report.

Conflict of Interest: None

No restricting contract

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