Comparative Study of Radiological Findings in Pulmonary Tuberculosis and Paragonimiasis in Children in a Southern Nigeria Fishing Community

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ABSTRACT

Background: Paragonimiasis is one of the re-emerging public health diseases. Most of the presenting symptoms of pulmonary paragonimiasis are similar to those of tuberculosis (TB), which is also another major public health issue. Unfortunately both infections occur in the same environment of low socioeconomic status. Clinical and radiological differentiation between pulmonary paragonimiasis and tuberculosis can be difficult. **Aim:** This study was therefore designed to identify the chest radiological features that could be consistently used to differentiate between pulmonary TB and paragonimiasis in children. **Materials and Methods:** Two hundred and forty children aged five to eighteen years, were selected by stratified random samplings from a public primary and a secondary school in Ewang village, Mbo local government area of Akwa Ibom State, Nigeria. These children were screened for pulmonary paragonimiasis and pulmonary tuberculosis using sputum microscopy and Ziehl Neilson staining, respectively. Thereafter, the chest radiographs of children who were sputa-positive for paragonimus egg and acid fast bacilli were taken on full inspiration. **Statistical Analysis:** The data was analyzed with the STATA 10 software, produced by Stata Corp, Texas, USA. The results were expressed as means, standard deviations (SD), as well as percentages. A $P < 0.05$ was considered statistically significant. **Results:** A total of 204 children were examined; 91 (44.6%) were males and 113 (55.4%) were females. Ten (4.9%) of the subjects were sputum-positive for the paragonimus egg, while four (1.96%) of the subjects were sputum-positive for tuberculosis. The signs and symptoms of both diseases were similar. Radiologically, subcutaneous tissue wasting was an important differentiating feature between both diseases ($P = 0.002$). **Conclusion:** The study has shown that paragonimiasis and tuberculosis in children coexist in this locality. The clinical features of both conditions were similar hence differentiation on clinical grounds was difficult. Thus in a child being investigated for tuberculosis, the absence of subcutaneous tissue wasting radiologically should prompt further investigation for paragonimiasis.

Key words: Paragonimiasis; pulmonary tuberculosis; radiological differentiation

Introduction

Paragonimiasis is one of the re-emerging public health diseases. About 300 million people are reportedly at risk for the infection. Residents living near fresh water bodies have a relative risk of 2.15 compared to persons living further away.[1]

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Most of the presenting symptoms of pulmonary paragonimiasis are similar to those of tuberculosis (TB), which is also another major public health issue, due to the increasing multidrug resistance and the Human Immunodeficiency Virus (HIV) pandemic.[2] Unfortunately both infections occur in the same environment of low socioeconomic status.[3] The striking similarities between the symptomalogies of TB and paragonimiasis constitute a major reason for frequent misdiagnosis.[4] Furthermore both diseases can coexist.[5]

The radiographic findings of pulmonary paragonimiasis are variable and are said to be similar to those of pulmonary tuberculosis, causing further confusion in the diagnosis.[4] The typical published finding of pulmonary paragonimiasis on radiographs appear as, patchy airspace consolidation, with or without a cyst, ring or 'honey comb' shadows, subpleural

linear opacities or bilateral pleural effusions.[6] Some studies seem to indicate that radiological findings cannot differentiate between paragonimiasis and tuberculosis.[7,8] Attempts, however, have been made, to differentiate the two by the characteristics ofthe pulmonary infiltrates.[6]

This study was designed to identify the chest radiological features that could be consistently used to differentiate between pulmonary TB and paragonimiasis in children. Such a differentiation would be particularly useful in a resource-limited environment like ours in South–South Nigeria.

Materials and Methods

Study area

The study was conducted in Ewang village, in the Mbo local government area of Akwa Ibom state, Nigeria. It is in a typical rain forest area with peak rainfall between June and September. The common occupations are farming, fishing, and hunting. The inhabitants eat seafood, which largely comprises of crayfish, crabs, shrimps, and periwinkles.

Methodology

Two hundred and forty children aged five to eighteen years were selected by stratified random samplings from two schools in the community. These children were screened for paragonimiasis and pulmonary tuberculosis.

An interviewer-administered questionnaire was used on each subject to determine the age, sex, and symptoms related to the respiratory system. A thorough respiratory system examination was performed for each subject. Sputum was collected from each subject in a snap-cap container with formalin as a preservative, and analyzed. About 1.5 ml of sputum was mixed with 3 ml of 4% sodium hydroxide. This was followed by adequate mixing and centrifugation at 1500 rpm for five minutes. The resulting sediments were transferred onto two microscope slides. One was observed under a light microscope at ×10 and ×40 magnification for the presence of paragonimus ova, while the other was stained with the Ziehl–Neilsen stain and examined at ×100 magnification for the presence of *Mycobacterium tuberculosis*. The chest radiographs of children who were sputa-positive for paragonimus egg and acid fast bacilli were taken on full inspiration. The radiographs were read by two radiologists independently. Those with paragonimiasis received free praziquantel 25 mg/kg t.i.d for three days, under supervision, while those who were acid fast bacilli positive were referred to their Local Government DOTS Unit for anti-tuberculous chemotherapy.

The data was analyzed with the STATA 10 software, produced by StataCorp, Texas, USA. The results were expressed as means, standard deviations (SD), as well as percentages. The statistical significance of difference was tested using the Student's *t*-test for continuous variables and the X^2-test for discrete variables, while the Fisher's exact test was used for variables with small numbers, as appropriate. A $P < 0.05$ was considered statistically significant.

Results

A total of two hundred and four children constituted the study population, comprising of 91 (44.6%) males and 113 (55.4%) females. The male to female ratio was 1:1.2 ($P = 0.054$). The age of the subjects ranged from five to eighteen years; the median age was 12 years. The sputum microscopy examination for paragonimus ova was positive in ten (4.9%) subjects, while the Ziehl–Neilson stain for acid and alcohol fast bacilli (AAFB) was positive in four (1.96%) subjects.

Table 1 shows that there is no difference in the clinical features of both pulmonary paragonimiasis and tuberculosis.

Table 1: Comparison of symptoms and signs of pulmonary paragonimiasis and tuberculosis

Clinical parameters	All subjects *N*	Paragonimus ova positive *n*(%)	AAFB positive *n*(%)	OR	95% CI	*P* value
Symptoms						
Cough	105	10 (100)	4 (100)			
Hemoptysis	18	10 (100)	4 (100)			
Chest pain	60	4 (40)	2 (50)	0.67	0.03-13.3	0.73
Fever	85	7 (70)	2 (50)	2.33	0.11-45.4	0.48
Difficulty in breathing	23	0 (0)	2 (50)			0.02
Chest examination						
No abnormality detected	188	7 (70)	2 (50)	2.33	0.11-45.4	0.48
Positive chest findings	14	3 (30)	2 (50)	0.43	0.02-9.16	0.48
Dull percussion notes	9	1	0			0.51
Reduced breath sounds	11	2	2	0.25	0.01-6.11	0.26
Transmitted sounds	1	1	0			0.51
Generalized rhonchi	3	1	0			0.51
Crepitations		0	2			0.02

AAFB – Acid and alcohol fast bacilli

The results also showed that the median duration of cough for children with paragonimiasis was 104 weeks (interquartile range = 26-156 weeks), while that of children with TB was 52 weeks (interquartile range = 12-104 weeks). The difference, however, did not achieve statistical significance (P = 0.18).

Table 2 shows that of all the chest radiological features, subcutaneous tissue wasting is the only significant (P = 0.002) differentiating feature between pulmonary paragonimiasis and pulmonary tuberculosis.

Discussion

The present study confirmed the existence of paragonimiasis and tuberculosis among primary and secondary school children, in Ewang, a village in the Mbo Local Government Area of Akwa Ibom state. The prevalence of paragonimiasis (4.9%) is consistent with other reports from school children in southern Nigeria.[5,9] The prevalence of tuberculosis (1.96%) is also consistent with other reports of school children.[5] This study further confirms the existence of both conditions in the same environment.

Cough, hemoptysis, fever, and chest pain were recorded in the paragonimus ova-positive subjects and these findings were similar to those recorded in some Laotian refugee children.[10] The reported prominence of cough and hemoptysis in the earlier studies suggested that these symptoms were usually present in subjects who were paragonimus ova-positive.[11,12] Symptoms seen in a study by Song *et al*.[13] in Korea also included chronic cough, hemoptysis, mild chest pain, and lassitude in both adults and children. There was, however, no significant difference between these symptoms in both conditions. This finding was similar to the earlier reports, in which paragonimiasis was seen to mimic pulmonary tuberculosis in symptoms like cough and hemoptysis.[14,7] Difficulty in breathing, however, was seen in children with tuberculosis, but not in those with paragonimiasis. This was consistent with the earlier reports,[15,16] where it was observed that this symptom was usually present in case of severe disease, with associated pleural effusion or when there was co-infection with tuberculosis.

Table 2: Comparison of radiological findings in subjects with paragonimiasis and those with tuberculosis

Radiological findings	Paragonimus ova-positive subjects (%)	Acid and alcohol fast bacillus positive (%)	*P* value
Subcutaneous wasting	0 (0)	4 (100)	0.0002
Nil lung parenchymal change	5 (50)	0 (0)	0.08
Diffuse haziness in both lung fields	4 (40)	1 (25)	0.68
Right upper zone haziness	0 (0)	1 (25)	0.1
Honey comb appearance	2 (20)	0 (0)	0.33
Accentuated vascular markings	1 (10)	0 (0)	0.51
Fibrotic strands	0 (0)	1 (25)	0.1
Reticulonodular shadows	0 (0)	3 (75)	0.2
Right basal opacity	0 (0)	2 (50)	0.16
Bilateral hilar opacity/fullness	4 (40)	3 (75)	0.24
Right hilum opacity	2 (20)	0 (0)	0.33
Normal hilum	2 (20)	2 (25)	0.84

There was also no difference seen in most of the chest signs of both infections and this was consistent with the earlier reports.[17] However, the presence of crepitations in children with tuberculosis was a significant finding. Earlier studies have observed that crepitations in pulmonary paragonimiasis may be seen in the acute phase of the infection, when the infection is diagnosed early, especially using serological methods.[11,18]

The radiological features observed in this study were mostly parenchymal for both disease conditions and they were similar. This was probably because sputum microscopy done for paragonimus ova usually picked infection in the chronic stage, while pleural lesions were observed in the acute stage of infection. This was similar to the findings recorded by Ogakwu *et al*.[19] All children with tuberculosis had radiological evidence of subcutaneous tissue wasting. This was highly and statistically significant (P = 0.0002). Radiological evidence of subcutaneous wasting is, therefore, an important differentiating factor in an area where both diseases exist. It is recommended that whenever subcutaneous wasting is absent in a child being investigated for tuberculosis, further investigation should be done to exclude paragonimiasis, in endemic areas.

In conclusion the study has shown that paragonimiasis and tuberculosis in children coexist in this locality. The clinical features of both conditions are similar, hence, differentiation on clinical grounds is difficult. Radiological evidence of subcutaneous wasting is, therefore, an important differentiating feature for both conditions.

The small number of subjects positive for paragonimiasis and tuberculosis in this study is a major limitation and warrants further studies on a larger scale.

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