



A Survey of Cryptosporidiosis in Tuberculosis Smear Negative Individuals

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ABSTRACT

The research was aimed to detect the occurrence of respiratory Cryptosporidiosis in TB smear negative non-HIV infected individuals with symptoms of tuberculosis. A total of 193 TB smear negative and HIV negative participants were enrolled in the study, from TB lab of Aminu Kano Teaching Hospital and Infectious Disease Hospital, Kano State. Sputum samples for the study was collected in a wide mouth screw-caped and leak-proof plastic container, and they were subsequently processed after preparation of smears with Modified Ziehl-Neelsen staining technique. Of all the 193 participants, 1(0.5%) patient was found to be positive for *C. parvum* while the other 192(99.5%) patients was found to be negative. With respect to age of the participants, the ages were categorized in to groups, 0-10, 11-20, 21-30, 31-40, 41-50, 51-60 and 61-70. The result shows that, the sputum positive for *C. parvum* was detected in an age group of 21-30. There were 60 participants in the group and only one positive was detected (1.7%), while the remaining 59(99.3%) were found to be negative. Hence, the sputa from other participants in the remaining age groups were all found to be negative for *C. parvum*. Out of the 193 participants recruited, 80(41%) were males and 113(59%) were females. *C. parvum* was detected in sputum of one male participant and the distribution of respiratory cryptosporidiosis in relation to gender of the participants was determined. Of all the participants, 16(8.2%) were not educated, i.e. they did not attend school, 49(25.4%) attended only primary school, 97(50.3%) attended primary and secondary schools, and 31(16.1%) attended tertiary schools. Only one sputum positive for *C. parvum* was detected in a participant that attended only primary school (2%), while the remaining 48(98%) were found to be negative. The other participants from remaining educational categories were all found to be negative. Of all the participants, 169(88%) do consume fish, while the remaining 24(12%) participants do not eat fish. 1(0.6%) of the 169 was found to be sputum positive for *C. parvum*, while the other 168(99.4%) was found to be negative.

INTRODUCTION

Cryptosporidium parvum is an intracellular spore forming protozoa that predominantly causes intestinal diseases. It causes severe and life-threatening diarrheal diseases in immunocompromised hosts and usually self-limiting disease in immunocompetent hosts. Extra intestinal manifestations of *Cryptosporidium* pathologic process are very infrequent (Kumar *et al*, 2016). There are serious unresolved difficulties regarding the explanation and, accordingly, the diagnosis of smear negative pulmonary tuberculosis. There are different recommendations in various program. According to the WHO definition, smear negative pulmonary tuberculosis is defined as Pulmonary tuberculosis cases with at least two negative sputum smears but growth positive in cultures (Çalışkan and Kaya, 2015). Smear-negative pulmonary tuberculosis can be confounded with many diseases because of diagnostic problems and therefore, its differential diagnosis is very important (Colebunders and Bastian, 2000). *M. tuberculosis* is an infectious agent that causes tuberculosis, the organism is acid-fast bacilli and usually attack the lungs, but can also affect other parts of the body. *M. tuberculosis* is transmitted from person to person by respiratory aerosol and its initial site of infection is the lungs. In the body, it resides chiefly within the reticuloendothelial cells, e.g. macrophages (Current and Garcia, 1991). Most transmission occurs by aerosols generated by coughing of smear-positive individuals, i.e those whose sputum contain detectable bacilli in the Acid-fast staining. *Mycobacterium tuberculosis* is associated with other respiratory pathogens, especially *Cryptosporidium parvum* and moreover, these organisms exhibit some overlapping clinical manifestations (Current and Garcia, 1991). Because of such overlapping clinical manifestations, one might present with some above-mentioned symptoms expecting the condition to be tuberculosis without knowing that infection with *C. parvum*, especially when it attacks respiratory tract, can absolutely leads to the presentation of such symptoms.

MATERIALS AND METHOD

The study population included all patients attending TB lab of Aminu Kano Teaching Kano and Infectious Disease Hospital, Kano.

Inclusion Criteria

All TB sputum smear negative individuals, who are HIV negative and presented themselves at the stated center were included.

Exclusion Criteria

Patients who are HIV positive and presented themselves to either of the stated center for AFB and are positive for TB were excluded.

Ethical Consideration

An ethical approval to carry out the study has been obtained from Research Ethical Committee of Aminu Kano Teaching Hospital (AKTH) and that of Infectious Disease hospital, Kano.

Sample Collection and Processing

The collected 5ml sputum samples were processed after preparation of smears with Modified Ziehl-Neelsen staining technique.

RESULTS

Of all the 193 participants, 1(0.5%) patient was found to be positive for *C. parvum*, while the other 192(99.5%) patients were found to be negative as shown in Table 4.1.

With respect to age of the participants, the ages were categorized in to groups, 0-10, 11-20, 21-30, 31-40, 41-50, 51-60 and 61-70. And the result shows that, the sputum positive for *C. parvum* was detected in an age group of 21-30. there were 60 participants in the group and only one positive was detected (1.7%) while the remaining 59(99.3%) were found to be negative. Hence, the sputa from other participants in the remaining age groups were all found to be negative for *C. parvum* as shown in Table 4.2.

Out of the 193 participants recruited, 80(41%) were males and 113(59%) were females. *C. parvum* was detected in sputum of one male participant and the distribution of respiratory cryptosporidiosis in relation to gender of the participants was determined and shown in Table 4.3. Of all the participants, 16(8.2%) were not educated, i.e. they did not attend school, 49(25.4%) attended only primary school, 97(50.3%) attended primary and secondary schools, and 31(16.1%) attended tertiary schools. Only one sputum positive for *C. parvum* was detected in a participant that attended only primary school (2%), while the remaining 48(98%) were found to be negative. The other participants from remaining educational categories were all found to be negative, as shown in Table 4.4. Of all the participants, 169(88%) do consume fish, while the remaining 24(12%) participants do not eat fish. 1(0.6%) of the 169 was found to be sputum positive for *C. parvum*, while the other 168(99.4%) was found to be negative as shown in Table 4.5.

Table 4.1: Occurrence respiratory cryptosporidiosis

Variables	N	%
Positive	1	0.5
Negative	192	99.5

Table 4.2: Distribution of respiratory cryptosporidiosis with respect to age

Age category	<i>Cryptosporidium parvum</i>	
	Positive N (%)	Negative N (%)
11-20	0(0%)	39(100%)
21-30	1(1.7%)	59(98.3%)
31-40	0(0%)	49(100%)
41-50	0(0%)	26(100%)
51-60	0(0%)	10(100%)
61-70	0(0%)	9(100%)

Table 4.3: Distribution of respiratory cryptosporidiosis with respect to gender

Gender	<i>Cryptosporidium parvum</i>	
	Positive N (%)	Negative N (%)
Male	1(1.3%)	79(98.7%)
Female	0(0%)	113(100%)

Table 4.4: Distribution of respiratory cryptosporidiosis with respect to educational level

Educational level	<i>Cryptosporidium parvum</i>	
	Positive N (%)	Negative N (%)
No	0(0%)	16(100%)
Primary	1(2%)	48(98%)
Secondary	0(0%)	97(100%)
Tertiary	0(0%)	31(100%)

Table 4.5: Distribution of respiratory cryptosporidiosis with respect to fish consumption

Fish consumption	<i>Cryptosporidium parvum</i>	
	Positive N (%)	Negative N (%)
Yes	1(0.6%)	168(99.4%)
No	0(0%)	24(100%)

DISCUSSION

Respiratory cryptosporidiosis is currently recognized as a rare, late-stage complication of chronic intestinal infection in persons with HIV infection and AIDS. In the most recent review of respiratory cryptosporidiosis (1996), more than 50 cases had been reported in persons with AIDS with fewer than 10 cases documented in persons with other immunodeficiencies. However, permissiveness of the respiratory tract to

Cryptosporidium infection is not common to humans (Mor *et al.*, 2010). Transmission of *Cryptosporidium* occurs through the fecal/oral route after the ingestion of oocysts (Infective stage of *C. parvum*). Ingestion can occur via person-to-person, zoonotic, waterborne, food-borne and airborne contact (Thompson *et al.*, 2005). *Cryptosporidium* usually infect small gastrointestinal tract epithelium, multiplies within the macrophages and causes diarrheal diseases. These spores can migrate to the whole gastrointestinal tract,

respiratory epithelium, and biliary tract. Severity of diseases depends on the immunity of the patients. In immunocompetent individuals, rapid clearance of the organism is responsible for asymptomatic and self-limiting disease (Wolska-Kusnierz *et al.*, 2007).

Of all the 193 participants recruited, we found only one *Cryptosporidium* positive sputum, these also signifies the rarity of respiratory cryptosporidiosis and also tells that the condition can also occur in an immunocompetent individual. The patient whom sputum sample was found to be positive for oocyst of *Cryptosporidium* was male, HIV negative, TB negative and at age between 21 to 30 years, which means that respiratory cryptosporidiosis can occur in an adult, immunocompetent individuals, not only in an immunocompromised subject.

This can be related to inhaling the oocyst of the parasite or probably due to hematogenous spread of the oocyst of the parasite as a result of improper hygiene (open defecation). Moreover, the fact that the patient whom was found to be positive for *Cryptosporidium* oocyst in sputum was male, we could also not report that respiratory cryptosporidiosis occurs more or less commonly in male individuals, nevertheless, respiratory cryptosporidiosis can also occur in adults. In conclusion, respiratory cryptosporidiosis is not only an extra intestinal manifestation of cryptosporidiosis in HIV infected individuals, but also in non-HIV infected individuals. Therefore, it will be very much helpful if screening of respiratory cryptosporidiosis in TB smear negative individuals is taken into routine consideration. Also, further research of this kind using advanced and more sensitive techniques such as molecular tests is

recommended, because of some poor sensitivity of microscopic method, even though microscopy is regarded as the gold standard method of parasitic diagnosis.

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