

PREVALENCE OF TUBERCULOSIS AMONG HIV/AIDS CHILDREN IN NIGER STATE \*KOLO, O. O., GALADIMA, M., DANIYAN, S. Y. AND ABALAKA, M. E



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#### ABSTRACT

Tuberculosis is one of the commonest opportunistic infections among people infected with HIV and one of the major causes of death among the immune suppressed individual. This study was aimed to determine the prevalence of tuberculosis among HIV infected children consulting at six selected General Hospital located in Niger State. Three hundred HIV positive and three hundred HIV negative children consulting at the Pediatric Department of the selected hospital were recruited for this study. Six hundred sputum samples were collected and analyzed microscopically using hot Ziehl-Neelsen hot staining technique. The overall prevalence of Tuberculosis among HIV infected children was seven percent while 2.09% prevalence was observed among HIV negative patients. The prevalence of tuberculosis in relation to gender among both HIV positive and HIV negative patients shows that children between ages of two and eight years had lowest prevalence of tuberculosis. Consulting patients in Chanchaga and Bosso Local Government account for highest prevalence of tuberculosis compare to their counterparts in other selected Local Government Areas. The prevalence of tuberculosis among HIV positive children was found to be significantly higher than the prevalence among HIV negative children. Therefore, prevention, treatment and control of Tuberculosis among HIV positive children should be an integral aspect of Control and eradication of Tuberculosis.

Keywords: Tuberculosis, Prevalence, Opportunistic, infections and HIV.

## INTRODUCTION

HIV infected children were co-infected with some opportunistic infections which become clinically apparent due to their weakened immune system. Tuberculosis is the most common co-infection in both children and adult HIV seropositive individuals which cut across geographical boundaries. WHO in 2011 recorded HIV as the leading and tuberculosis as the second leading cause of death from infectious diseases in developing countries. HIV-positive children are at risk of diagnostic error as well as delayed diagnosis of tuberculosis because of overlapping clinical and radiographic features with other lung diseases (UNAIDS, 2011). The manifestations of tuberculosis and HIV co-infection among children have been reported to be more severe and and consequently, increase the mortality and morbidity rate of paediatric HIV infection. Tuberculosis has also been reported to increase the progression of HIV disease to AIDS diseases by increasing viral replication and reducing CD4 counts further. HIV infected children have also been reported to have a six-time greater risk of dying of tuberculosis when compared with their HIV negative counterpart and the response to standard short-course therapy in HIV-positive children is not as effective as in HIV-negative children due to lower cure and immune rates system and higher mortality. The key factor behind the resurgence of incidence of tuberculosis is the increase in global epidemiology HIV infection. Most the high burden case of tuberculosis and HIV co-infection is in Africa where one third of approximately 2.3 million who were diagnosed with tuberculosis were also positive to HIV infection in 2010. In 2013, WHO estimated about 35.5 million people living with HIV out of which 70% were from sub Sahara Africa. Although estimated rates of tuberculosis among HIV infection varies widely, but currently, World Health Organization ranked Nigeria as the leading country with high burden of tuberculosis HIV co-infection in Africa and third with higher prevalence globally (WHO, 2015).Tuberculosis in an HIV infected child is considered to be a clinical indication severe immune suppression and for rapid progression to AIDS diseases (Mofenson et al., 2009). The challenges of diagnosis of tuberculosis among HIV infected children also play an important role in its prevalence worldwide. The inability of the seropositive

children especially those below five years of age to expectorate sputum and difficulties in obtaining gastric aspirates might also affect the prevalence rates of tuberculosis and HIV infection in developing country. Poor diagnosis and reporting of cases of tuberculosis in children prevent accurate estimation of the burden of the disease from paediatric tuberculosis. Tuberculosis and HIV coinfection although has had a great epidemiology effect in the country, the effects has induced a pronounced shift in the age and sex. This has been seen in the increase of tuberculosis co-infection among children born to HIV positive mother co-infect with tuberculosis. Antiretroviral and anti-tuberculosis treatment was recommended by World Health Organization recommended for children starting as soon as they can be tolerated. The choice of treatment has been reported to depend on the child age and appropriated age formulations and based on this reports, this study was designed to determine the prevalence of Tuberculosis among HIV infected children in Niger State, with the ultimate goal of improving the treatment and management of HIV positive children.

## METHODOLOGY

**Study Area:** The samples were collected from government owned General Hospitals (HIV treatment centers) located in the administrative headquarter of selected Local Government Areas. The selected local government areas are Chanchaga, Bosso, Bida, Kontagora, Suleja and Lapai.

**Ethical Clearance:** Ethical clearance for this study was obtained from the Hospital Management Board Research Ethics Committee, Minna, Niger State.

**Study Populations:** The populations enrolled in this study were children (both inpatient and outpatient) between two and sixteen years of age attending general hospital located in the administrative headquarter of selected LGAs. The children and young adults sampled fell into two groups, Group one comprised of children that were not infected with HIV that were attending the selected hospitals.

Group two children were confirmed or presented with history of HIV-infection.

The prevalence of tuberculosis and HIV co-infection among HIV positive individuals was taken as 50% and double proportion formula was applied to calculate the sample size which was 50 on HIV positive and 50 HIV negative groups.

A 5% non-response rate was added and the final calculated sample size was 100. Study participants were selected by simple random sampling techniques. One hundred sputum samples were collected from each study site; fifty samples from each of the group selected and the overall sample collected in the study site is six hundred sputum samples. The patients were instructed to cough up the phlegm/mucus and expel it into a clean, dry, sterile, wide-necked and leak proof container provided (WHO, 2012). All samples collected were taken to the laboratory promptly for processing while they were still fresh. The sputum samples were examined macroscopically and was recorded as either purulent, mucopurulent, mucoid, mucosalivary or bloody. The most recent  $CD_4$  T-cells counts of the participants were obtained from their ART fellow-up record in the hospital.

Ziehl-Neelsen hot staining technique was used to determine the presence of *Mycobacterium tuberculosis*. The stained smear was examined microscopically using oil immersion objectives (Cheesbrough, 2009). Data were entered into Microsoft excel and transported to SPSS Version 16 software for analysis. The prevalence of tuberculosis and HIV co-infection was determined in relation to different variables Pearson's chi square test was used to assess statistical significance difference between proportions. A statistical test result was reported as significant when its P < 0.05.

#### RESULTS

The prevalence of tuberculosis in relation to age groups among HIV seronegative patients in selected Local Government Areas was presented in Figure 1. The prevalence of tuberculosis was lower among seronegative patients. Age group 10 - 11 years shows a significant higher prevalence of tuberculosis than other age group studied. None of the patients between the age of 2 and 9 years were positive for tuberculosis from all the selected LG Areas.



Figure 1: Prevalence of Tuberculosis among HIV Seronegative Patients

Prevalence of tuberculosis among HIV seropositive patients in relation to age group is shown in Figure 2. Tuberculosis is shown to be more prevalent among the subject and the rate of infection increases among older patients than the younger one.



Table 1. Flev	alence of Tubercu	iosis ili Kelat	ioli to Hi v statu	s in selected	Local Govern	ment Areas							
				HIV Sero	oositive					HIV S	eronegative		
			Male	_		Female			Male		_	Female	
Local		No.						No.					
Government	Total Sample	Examine		%	No.	No.	%	Exami	No.	%	No.	No.	
Areas	Examined	d	No. Positive	Positive	Examined	Positive	Positive	ned	Positive	Positive	Examined	Positive	% Positive
Chanchaga	100	28	3	10.71	22	1	4.55	39	1	2.56	11	0	0.00
Bosso	100	15	2	13.33	35	2	5.71	41	0	0.00	9	1	14.29
Suleja	100	29	1	3.45	21	1	4.76	30	0	0.00	20	0	0.00
Lapai	100	27	1	3.70	23	3	13.04	28	0	0.00	22	0	0.00
Bida	100	29	2	6.90	21	3	14.29	35	0	0.00	15	0	0.00
Kontagora	100	16	0	0.00	34	1	2.94	20	2	10.00	30	0	0.00
Total	600	144	9	6.25	156	11	7.05	181	3	1.64	119	1	0.85

# Table 1: Prevalence of Tuberculosis in Relation to HIV status in Selected Local Government Areas

Prevalence of tuberculosis in relation to CD4 count is shown in Table 4.2. The CD4 counts were grouped into five, those count less than 100; counts between 101cell/µl and 200cell/µl; 201cell/µl and 400cell/µl; 201cell/µl and 600cell/µl CD4 count. Result from Lapai local government area was not included because access to the CD4 counts was denied by the hospital authority. The rate of tuberculosis was higher among subjects with CD4 counts lower than 100cell/µl. The result also showed that as the CD4 count increases, the prevalence rate of infection decreases.

Tuble 2. I I conclete of Tuble curosis in Relation to CD+ Count among III ( I ostite I attents in Selected DO Micus	Table 2: Prevalence of	Tuberculosis in Relation	n to CD4 Count among	g HIV Positive Patients	in Selected LG Areas
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CD4 Count	Chanchaga			Bosso			Suleja			Kontagora			Bida		
cen/µi	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
	Examined	Positive	Positive	Examined	Positive	Positive	Examined	Positive	Positive	Examined	Positive	Positive	Examined	Positive	Positive
<100	3	2	66.67	6	4	66.67	5	2	40.00	0	0	0.00	2	2	100.00
100 - 200	10	1	10.00	7	0	0.00	6	0	0.00	8	2	4.00	4	1	25.00
201 - 400	3	1	33.33	19	1	5.26	9	1	11.11	4	0	0.00	5	0	0.00
401 - 600	10	0	0.00	4	0	0.00	11	0	0.00	21	0	0.00	6	0	0.00
> 600	24	0	0.00	14	0	0.00	19	0	0.00	17	0	0.00	33	0	0.00
Total	50	4	8.00	50	5	10.00	50	4	8.00	50	2	2.00	50	3	6.00

Prevalence of tuberculosis in relation to HIV status is shown in table 1. The prevalence rate was shown to be higher among females who were HIV seropositive 11(7.14%) and relatively high among seropositive males 9(6.25%). The HIV seronegative females had the lowest prevalence among all the patients.

## DISCUSSION

There is a paucity of information available on the clinical profile of opportunistic infections among HIV infected children in Nigeria (Brown *et al.*, 2012). However, tuberculosis has been known to be more common among HIV-infected children and adults because of the abnormalities in humoral, cellular, and mucosal immunity (Piroon, 2007). High prevalence of different opportunistic bacterial and parasitic infections was generally observed during the study, and higher among HIV seropositive patients.

The prevalence of tuberculosis (TB) in all the selected LG Areas among HIV seropositive patients was observed to be significantly higher than those observed among HIV seronegative patients (figure 1 and 2 and table 1). The range of infection was between 0% to 66.67% among HIV positive children and 0% to 25% among HIV negative patients. Moreover, the prevalence rate of TB was found to be higher among HIV seropositive patients 20 (7%) than HIV seronegative patients 4 (2%). Sebhat and Solomon, (2011), in Ethiopia similarly observed higher prevalence of tuberculosis among HIV infected individual. High prevalence or resurgence of tuberculosis have been reported in several parts of the country which was attributed to differences in socio-economy factor and poor health seeking altitude of the general public. Ugochukwu (2010) reported a prevalence of 40% in south eastern part of the country while in another study in north centre state reports a prevalence of 32%. The high prevalence of HIV and tuberculosis co-infection observed in this study is also in agreement with WHO report of 2015which ranked Nigeria as the first among countries with the highest burden of tuberculosis. About 7% of the HIV seropositive females had positive cases of tuberculosis, which is higher than the percentage positive cases found in male seropositive patients (6%). The percentage prevalence of tuberculosis varied across all the selected Local Government Areas. This could also be as a result of differences in the population; sanitary conditions, infection burden and settlement.

It was observed that there was a significant and a sharp increase in the prevalence rate of tuberculosis with the age of the patients (Table 1, Figure 1 and Figure 2). Lower prevalence of tuberculosis in younger patients (below 10 years of age) could be as a result of the inability of the younger patients to produce sputum needed for Zeil-Neelsen acid fast bacillus test. This can be seen clearly in the different prevalence rate in children below 5 years, and those aged 5 - 16 years. Again, exposure to infection could also partly explain the difference between those aged 5 - 16years. Most of the TB cases in children have been reportedly occurred in children above five years of age. The age range of zero to five years has often been called the "favoured age" because those in this age range have the lowest rates of tuberculosis (Mbow, 2013). Prevention, early diagnosis and treatment of tuberculosis are essential

components of care of HIV-positive patients since the development of tuberculosis has been shown to accelerate the course of HIV infection (Mbow, 2013).

The prevalence of tuberculosis in relation to CD4 count shows that patients with CD4 counts lower than 100cell/µl had prevalence of tuberculosis as high as 100% in Bida Local Government Area (table 1). Patients with higher CD4 counts had prevalence rate as low as 0%. This result shows that patients with lower CD4 count are more susceptible to tuberculosis than those with higher CD4 count. This result was in agreement with several reports on susceptibility of HIV infected patients to several opportunistic and non opportunistic infections which could either from bacteria, fungi or other viral source (WHO, 2012). High prevalence of TB observed among HIV positive patients with CD4 counts lesser than 200cells/µl could be as a result of compromised immune system of this group of people. It is worth saying that this group of people are progressing rapidly from HIV infection to AIDS disease.

## CONCLUSION

TB and HIV both represent major threats to public health worldwide. Pediatric TB and HIV have overlapping clinical manifestations which always lead to mis-diagnosis and late diagnosis of the infection. The prevalence of tuberculosis among HIV positive children was found to be significantly higher than the prevalence among HIV negative children as significant increase in prevalence among adults has been reported in several parts of the country. Therefore, in view of several challenges in diagnosis of pediatric tuberculosis, prevention, treatment and control of Tuberculosis among HIV positive children should be an integral aspect of Control and eradication of Tuberculosis.

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