IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 4 Ver. XI (Apr. 2016), PP 99-105
www.iosrjournals.org

Prevalence of Tuberculosis among HIV co-infected Patients attending BHUTH, Plateau State, Nigeria

Bassi AP[1], Thildza SMA[1], Lawson L[1], Ogundeko TO[2], Ramyil MS[3], Ike RO[3], Chima AAG [4], Okeke FC[5], Abunike SA[5], Anom-Ogisa IT[5], Achukoh CP[5], Oghenejivwe DE[5]

[1]*Department of Community Medicine, College Medicine and Health Sciences, Bingham University, Jos, Nigeria*
[2]*Department of Pharmacology and Therapeutics, College Medicine and Health Sciences, Bingham University, Jos, Nigeria*
[3]*Department of Medical Microbiology, College Medicine and Health Sciences, Bingham University, Jos,Nigeria*
[4]*Department of Family Medicine Bingham University Teaching Hospital, Jos, Nigeria*
[5]*Department of Medicine and Surgery, College Medicine and Health Sciences, Bingham University, Jos,Nigeria*

Abstract
Background*: The incidence of tuberculosis (TB) has increased greatly since the advent of HIV/AIDS because they tend to coexist. Prompt identification of risk factors is quite imperative to prevent the disease as early diagnosis and treatment are required to reducing mortality, thus determination of the prevalence of TB and HIV co-infection in BHUTH is a necessary objective.*
Methods*: A total of 203 randomly selected male and female (non-pregnant) patients of age 17 years and above that has never been treated for TB in the past regardless of the patient's HIV status, from August to October 2015 attending the TB Clinic of BHUTH in Jos, Nigeria. Subjects were administered with structured questionnaire and clinically examined in order to assess their risks of having TB and living with HIV/AIDS in order to authenticate study objectives. Two sputum samples were collected on the spot and after a day interval, stained using Ziehl-Neelsen's method and examined in accordance with standard procedures while blood specimens were collected for HIV screening using WHO serial test algorithm 2010.*
Results*: Fifty five percent (54.2%) of the patients had received BCG at birth by evidence of scar. 7.9% patients tested positive for sputum (AFB) on the spot while 8.4% tested positive for sputum one day after. However, 29.1% of the patients tested positive for HIV. Most of the cases were seen in the age ranges between 17-29 years with 47.1%, 30-49 years with 41.2%, and 50-69years with 11.8% respectively. All patients with positive sputum (AFB) reported bouts of cough while 29.4% of patients with positive sputum had blood in their coughed out sputum.*
Conclusion*: Tuberculosis is a major public health issue which kills about 3 million people each year. Its existence with HIV as co-infection (23.5%) and high occurrences of common symptoms / features of TB cases (cough, fever, night sweat, weight loss and chest pain) are evident in BHUTH, thus signifies high risk of endemicity; and the continued spread of the disease require direct health promotion messages to stimulate a sustained health seeking behavioural change in the region.*
Keywords*: Sputum AFB, Tuberculosis, HIV co-infection, Health promotion, BHUTH, Nigeria.*

I. Introduction

Tuberculosis also known as (TB) is one of the most common causes of death in adults in the world. The world Health Organization (WHO) in 2014 estimates that more than 9.6 million people were infected with the tubercle bacilli and about 1.5 million people died from the disease. About one-third of the world's population has latent TB, that is, a large number of people are infected with TB and a fewer number transmit the disease. The symptoms of TB (cough, fever, night sweats, weight loss etc) may be mild for many months, invariably leading to delays in seeking care and could result in transmission of the disease to others. Over 95% of TB deaths occur in low and middle income countries and TB is among the top five causes for women aged 15 to 44 years. An estimated 43 million lives were saved through TB diagnosis and treatment between 2000 and 2014 [1]. In Jos, North Central Nigeria, an audit showed that 45% of HIV infected patients patient admitted on the medical ward of a referral hospital had pulmonary tuberculosis [2]. TB issues such as symptoms and diagnosis[3], [4], treatment[5],[6],[7] and effect on the immune system [8], [9], prevention [10], risk associated with treatment [11] have posed lots of questions to the world for many years up to this moment as a result of ignorance. Apart from HIV being the single most important factor for the resurgence of TB globally, it also contributed to the failure to achieve set TB control targets especially in areas with high prevalence [12]. Pregnant women living with HIV are at risk for tuberculosis which can adversely influence maternal and

perinatal outcomes. Studies have shown that about 1.1 million people were diagnosed with the co –infection in 2001 alone and each year approximately 7million people due as a direct consequence of acute and of chronic respiratory tract infections in Nigeria [13]. Tuberculosis is a multi-systemic disease with myriad presentations and manifestations. It is caused by Mycobacterium tuberculosis (MTB) a tubercle bacillus. Being an important public health problem with high mortality rate in sub-Saharan Africa, knowledge of the prevalence of TB in our community is important so as to sustain the needed awareness creation, enable prompt diagnosis, treatment and setting up preventive measures in the health facilities and community at large by way of knowledge of the associated risk factors.

II. Literature Review

TB is second only to HIV/AIDS as the greatest killer disease worldwide due to a single infectious agent [15], [16]. In 2013, an estimated 550,000 children became ill with TB and 80,000 HIV negative children died of TB is a leading killer of HIV positive people causing one fourth of all HIV related deaths [9], [36, [38]. Although, the estimated number of people falling ill with TB each year is declining slowly, this clearly shows that the world was on track to achieve the Millennium Development Goal to reverse the spread of TB by 2015, as the TB death rate dropping by 45% between 1990 and 2013. An estimated 37 million lives were saved through TB diagnosis and treatment between 2000 and 2013[1]. In regions where HIV infection is common, such as sub-Saharan African, tuberculosis rate have increased rapidly. The critical role of T lymphocytes in tuberculosis host defence and pathogenesis has been brought into sharp focus by the worldwide epidemic of HIV/AIDS. In regions where HIV infection is common, such as sub-Saharan African, tuberculosis rate have increased rapidly, although treatment with antiretroviral agents can restore some of the immune responses beneficial in tuberculosis. In patients with latent infection, HIV infection, particularly in the absence of antiretroviral therapy, is the leading risk factors for the development of active disease, occurring at a rate as high as 10% per year, as compared with 10% across a lifetime in otherwise healthy, HIV negative persons. Patients with HIV infection who develop tuberculosis have different clinical presentations and have higher mortality early in the course of therapy than those with tuberculosis without HIV infection [14]. Both TB and HIV have profound effects on the immune system, as they are capable of disarming the host's immune responses through mechanisms that are not fully understood. HIV co-infection is the most powerful known risk factor for progression of *M. tuberculosis* infection to active disease, increasing the risk of latent TB reactivation 20-fold [15], [16]. The main goal of Nigeria's TB program is to halve the TB prevalence and death rates by 2015. TB death rates have declined from 11% in 2006 to 5% in 2010. Lagos, Kano, and Oyo have the highest TB prevalence rate. Other status in Nigeria experienced a drop in cases notified, resulting in a 4% overall decline in 2010. Oyo increased by 46.5% from 2008 to 2010. Benue had a high TB burden which is attributable to a high HIV prevalence. The age groups commonly affected by TB are the most productive age groups, with the 25 – 34 age group accounting for 33.6% (15,303) of the smear positive cases registered in 2010 [17],[18].The factors that predispose people living with HIV to opportunistic infections are higher in individuals with lower socio-economic status. Overcrowding and poor hygiene have been suggested as contributory factors to high burden of HIV related opportunistic infections in developing countries[19]. Persons with latent tuberculosis have no signs or symptoms of the disease, do not feel sick, and are not infectious. However, viable bacilli can persist in the necrotic material for years or even a lifetime and if the immune system later becomes compromised, as it does in many critically ill patients, the disease can be reactivated[20].Primary pulmonary tuberculosis is often asymptomatic, so that the results of diagnostic tests are the only evidence of the disease. Dullness to percussion and a lack of breath sounds physical findings indicative of a pleural effusion because excess fluid has entered the pleural space [21]. Active tuberculosis develops in only 5% to 10% of persons exposed to M. tuberculosis. When a patients progresses to active tuberculosis, early signs and symptoms are often nonspecific. Manifestations often include progressive fatigue, malaise, weight loss, and a low- grade fever accompanied by chills and night sweats [22].

Several polymorphisms in the human NRAMP1 gene have been identified, and population based studied in several regions have been conducted which have identified increased relative risk for moving from latent infected to active disease associated with certain polymorphisms[23]. However, the risk attributable to these polymorphisms is relatively small, and it is clear that NRAMP alone explains only a portion of genetic susceptibility to tuberculosis. Various lines of evidence indicate that inborn errors of immunity, as well as genetic polymorphisms, have an impact on susceptibility to TB and HIV [24]. Diagnosis of TB in HIV infected individuals and vice versa has also posed quite a lot of challenges to clinical practice due to the fact that there are not one way of doing this based on symptoms/presentations and other parameters. For instance, HIV patients have higher rates of sputum smear-negative disease. Smear-negative, culture-positive TB is more common and occurs more frequently with advanced immunosuppression. Rates of AFB smear-negative disease vary widely but have been reported as high as 66% [25]. In one study, the presence of cough of any duration, fever of any duration, or night sweats lasting 3 or more weeks in the preceding 4 weeks was 93% sensitive for TB, but only

36% specific [26] Low CD4 cell counts are associated with an increased frequency of extra pulmonary TB, positive mycobacterial blood cultures, and atypical chest radiographic findings, reflecting an inability of the impaired immune response to contain infection.[27]. In one series, use of 1 broth-based Mycobacteria Growth Indicator Tube (MGIT) culture identified 71% of TB cases, and use of 3 MGIT cultures had the highest yield of strategies evaluated, identifying 98% of TB cases. In terms of incremental yield, a second MGIT culture identified 17% more TB cases, whereas the third MGIT culture had yielded 10% more cases than the second culture.[28]. Bronchoscopy with bronchoalveolar lavage and transbronchial biopsy may be useful in the evaluation of persons with abnormal chest radiograph imagery when sputum smear results are negative. In this setting, a rapid presumptive diagnosis of TB, based on histology and AFB smear of specimens obtained by bronchoscopy, can be made in 30-40% of individuals; that is similar to the yield of bronchoscopy in HIV-uninfected cases with smear-negative pulmonary TB.[29]. Chest radiographs may appear normal in up to 21% of those with culture-positive TB and CD4 counts of <50 cells/µL,thus a high index of suspicion must be maintained in evaluating an HIV-infected patient with symptoms suggestive of TB especially such with greater degree of immunosuppression (i.e. CD4 count <200 cells/µL) [30], [31], [32].

2.1 Aim and Objective: The aim and objective of this study to determine the prevalence and the common signs and symptom of TB among HIV co-infected Patients attending BHUTH, Jos Nigeria.

III. Materials And Methods

Study was carried out among a total of 203 randomly selected male and female (non-pregnant) patients of age 17 years and above that has never been treated for TB in the past regardless of the patient's HIV status, attending the TB clinic of the Bingham University Teaching Hospital, Jos, Nigeria from August to October 2015. Subjects were seen in the clinic voluntarily agreed to and had a structured questionnaire administered and clinically examined in order to assess their risks of having tuberculosis, living with HIV/AIDS and to authenticate the study objectives. The patients were given sterile sputum pot in which they produced sputum samples. Two sputum samples were collected, one on the spot and the second the next day being a day interval, sputum samples were stained using Ziehl - Neelsen's method and examined in accordance with standard procedures while blood specimens were collected for HIV screening using WHO serial test algorithm 2010.

3.1 Ethical Issues: Ethical approval was obtained from The Health Research Ethical Committee of Bingham University Teaching Hospital, Jos, Nigeria.

3.2 Data Analysis and Sample Size Determination

Data collected was analyzed using EPI info computer software while minimum sample size was calculated with the formula below:

$N= \quad Z^2 PO/D^2$

Where N = the minimum sample size

Z = standard normal deviate at 95% confidence interval i.e 1.98

P = proportion of population with characteristics of interest

Q = 1-P

D = level of precision i.e. 0.05

$Z - 1.95^2$ P = 0.095 $D = 0.05^2$

Calculated minimum sample size = 135.72.

IV. Results

TABLE 1: Sociodemographic Data of patients

Characteristics	Frequency (No.)	(%)
SEX		
Male	100	49.3
Female	103	50.7
Total	203	
AGE		
17 – 29	46	22.7
30 – 49	97	47.8
50 – 69	50	24.6
70 ≥	10	4.9
Total	203	
LEVEL OF EDUCATION		
None	10	4.9

Primary	21	10.3
Secondary	67	33.0
Tertiary	105	51.7
Total	203	

50.7% of patients were females and forty nine point three percent (49.3%) were male; twenty two point seven percent (22.7%) of patients were of the age range between 17 - 29, 47.8% were of the age range 30 – 49, 24.6% were of the age range 50 – 69, while 4.9% were of the range 70 and above; 4.9% of patients had no formal education while 10.3% had primary education level, 33% had a secondary education level, and 51.7% had a tertiary level of education.

TABLE 2: Clinical diagnosis and Behavioural risk assessment of patients

Characteristics (No.)	(%)	Frequency
SEX STRATIFIED BY POSITIVE SPUTUM		
Male	10	58.8
Female	7	41.2
Total	17	
AGE STRATIFIED BY POSITIVE SPUTUM		
17 – 29	8	47.1
30 – 49	7	41.2
80 – 69	2	11.6
70 ±	0	0.0
Total	17	
HAVE YOU HAD BCG AT BIRTH OR ANY OTHER TIME?		
Yes	110	54.4
No	31	15.3
Not known	62	30.5
Total	203	
DID YOU COUGH RECENTLY?		
Yes	17	100
No	0	0
Total	17	
WAS THERE BLOOD TRACES IN THE COUGH SPUTUM?		
Yes	5	29.4
No	12	70.6
Total	17	
ANY CHEST PAIN?		
Yes	15	88.2
No	2	11.8
Total	17	
ANY WEIGHT LOSS?		
Yes	14	82.4
No	3	17.6
Total	17	

41.2% of positive patients were females when sputum was taken on the spot and after a day interval while 58.8% of positive patients were males; more positive cases of sputum AFB were seen in the age range between 17 – 29 with 47.15, the age range of 30 – 49 was 41.2% while that of 50 – 69 was 11.8%, no positive case was seen in those between the ages of 70 and above. This indicating the increased risk in the working class population, and also shows several activities increase the risk associated with this age group. 54.2% of patients had BCG at birth or any other time, 15.3% had never had BCG while 30.5% did not know or could not remember they had had BCG; 100% had positive sputum AFB had a recent cough indicating recent cough, majority more than three weeks as a common presentation of TB. 29.4% with positive sputum AFB had blood in their cough out sputum, while 70.6% with positive sputum AFB had no blood in cough out sputum indicating that blood in cough out sputum as a presentation of Tb but not a common presentation of TB; 88.2% with positive sputum AFB presented with chest pain while 11.8% with positive sputum AFB had no chest pain

presentation of TB. 82.4% with positive sputum AFB had weight loss indicating that weight loss as a common presentation of TB while 17.6% did not experience weight loss.

TABLE 3a: Prevalence of Sputum on the spot

Sputum AFB on Spot	Frequency	
	No	%
Positive	16	7.9
Negative	187	92.1
Total	203	100

TABLE 3b: Prevalence of Sputum AFB after one day

Sputum AFB after one day	Frequency	
	No	%
Positive	17	8.4
Negative	186	91.6
Total	203	100

A total of 16 (7.9%) patients that were suspected to have tuberculosis had positive sputum AFB on the spot while a total of 17 (8.4%) patients had positive sputum AFB after one day interval.

TABLE 4: Prevalence of HIV test results

HIV Test	Frequency	
	No	%
Positive	59	29.1
Negative	144	70.9
Total	203	

TABLE 5: Prevalence of HIV test results co-infected TB by positive sputum AFB

	HIV						
	Positive	Negative	Total	Sensitivity	Specificity	PPV	NPV
Sputum AFB							
Positive	4	55	59	23.53%	70.4%	6.8%	90.97%
Negative	13	131	144				
Total	17	186	203				

All suspected patients had a HIV test done, 29.1% (59) of all the patients were HIV positive while 70.9% (144) of all patients were HIV negative; 23.5% of the patients with positive sputum AFB were HIV positive while 76.5% with positive sputum AFB were HIV negative.

TABLE 6: Significant values of TB/HIV co-infection

	HIV					
	Positive	Negative	Total	Chi-square value	P - value	Remark
Sputum AFB						
Positive	17	42	59	2.642	< 0.05	Significant
Negative	59	85	144			
Total	76	127	203			

V. Discussion

The total sample population of 203 (50.7% females; 49.3% males), complied with the calculated minimum sample size (135.72) out of which the HIV status of sampled patients were 29.1% (59); 70.9% (144) negative while that of TB status as confirmed from AFB sputum were 23.5% (positive); of the patients with positive sputum AFB were HIV positive while 76.5% (negative).

Findings from sputum collected for AFB from HIV positive patients after one day interval indicated males with more positive cases (females 41.2%; males 58.8%), more positive cases of TB occurred in younger age group ranges between 17-29 (47.1%), 30-49 (41.2%), 50-69 (11.8%) and least 70-above (0%) . These correspond to a similar study conducted in Jos and Kano by Bigwan *et al*. 2013 and Taura et al. 2008 in which males (12.34%) having a higher prevalence compared to females (6.71%) and that more positive cases of TB age group between 15 and 45 and least in the age group 56 and above [33], [34] also reported 61.5% males and 38.5% females. Reasons for these may be associated with risky behaviours such as smoking and chronic alcohol intake which is seen more in men, making them more susceptible as well as the societal demands on youth age groups, since they constitute the most productive part of national development [33], [34]. Their engagement in several activities may predispose them to the infection. Another study that was conducted in Kano by Imam et al. 2008 also corresponds with the foregoing as reported by [35], patients attending infectious disease control hospital in Kano 2008 presented highest prevalence of TB among patients within the youthful age (15 – 43)

[35], while [36] concluded that this age group constitute the most mobile and productive individuals in the society and as result, the TB control programme will need to increase measures to address TB among this group in order to reduce transmission in the community. Results from table 8 on the contact data of the TB infected patients that sleep alone and those who do not sleep alone in same room respectively (11.8% ;88.2%) is an indication that TB can be transmitted between people in close contact especially if one is infected. This also further agrees with the study carried out in Zaria by Ndalilnaiiya *et al.* 2010, who showed increased prevalence of TB among patients having more than three persons living in a room thus an important finding, considering that inhalation is the major route of transmission of tuberculosis [37]. Present study pointed out (58.8%) positive sputum AFB cases of patients who have received BCG at birth or any other time, (5.9%) of patients didn't have BCG at birth or at any time, while 35.3% of patients didn't know if they had BCG at birth but also had a positive sputum AFB, indicating that BCG vaccine does not necessarily give a complete protection against TB. A study done at University of Calabar Teaching Hospital in 2015 showed an increase prevalence of TB in BCG immunized children (66.2%) as against (46.7%) in those not vaccinated [38]. Even when given routinely, the significance of BCG has recently been questioned as an efficient method of prevention of TB; it has a low efficacy in preventing infectious TB in some countries with high disease burden [38]. It has obviously become a subject of continuous debate. Some common clinical presentations of TB among patients attending BHUTH from study results - Patients with positive sputum AFB (100%) had recent coughing presentations indicating cough as a common symptom of TB, out of which, 29.4% had blood in coughed sputum, while 70.6% had no blood in coughed sputum indicating that blood in coughed out sputum as non a common presentation of TB. However this should not rule out the need to have all patients with blood in sputum screened for TB. Further clinical examinations on patients with positive AFB had the following presentations - Chest pain (88.2%), weight loss (82.4%), suggesting the two parameters as common presentations of TB as this observation corresponds with the study done in Benin City by [39] where the study population exhibited weight loss (96.4%), chest pain (80.4%) also with fever (85.7%). Results from study on the prevalence of TB in HIV positive patients exhibited 23.5% negative and 76.5% positive status from sputum AFB. A similar study done in Ibadan by [40] who also found the prevalence of TB in patients co-infected with HIV to be 7.3% (positive) as against 92.7% (negative). However, indications of low percentage of positive TB and HIV co-infection is suggests that HIV positive patients may not necessarily have TB infection but are susceptible to such for the fact that co-infections of same is established. Human Immune deficiency virus (HIV) and respiratory tract infections are common in Africa. HIV is generally associated with different opportunistic infections including those of both upper and lower respiratory tract which constitute a major cause of morbidity and mortality in people living with the diseases [41], [42]. Moreover, the observed significant P value (<0.05) among patients with TB/HIV co-infection is quite indicative of prevalence and risk of same in the middle belt region of Nigeria.

VI. Conclusion

Tuberculosis is a major public health issue which kills about 3 million people each year. Its existence with HIV as co-infection (23.5%) and high occurrences of common symptoms / features of TB cases (cough, fever, night sweat, weight loss and chest pain) are evident in BHUTH, thus signifies high risk of endemicity; and the continued spread of the disease require direct health promotion messages to stimulate a sustained health seeking behavioural change in the region.

VII. Recommendations

The sputum AFB and an adequate history are reliable methods of diagnosis. Culture method should be encouraged by providing facilities for such in our Health facilities as sputum AFB is less sensitive to the culture method.

The high prevalence of HIV contributes largely to the susceptibility of TB thus, healthcare providers should take up commensurate responsibility to educate and enlighten the grass root communities on TB, its common signs and symptoms to enable prompt diagnosis and treatment. However, there is need to link the ongoing jingles on HIV prevention with tuberculosis awareness and control measures to all communities.

Women in the community should be educated about new born BCG vaccination as this may reduce the risk of being infected with T.B.

Acknowledgement

Many thanks to the Management, and Staff of the Laboratory Unit especially Mrs EK Ajala of Bingham University Teaching Hospital, Jos Nigeria.

References

[1]. World health organization report on tuberculosis. 2015.
[2]. Idoko, J.A and Anteyi, E. (1994). HIV associated tuberculosis in Jos. Nigeria Medicinal practices; 28:49-54.
[3]. TB Alert ' Symptoms' [acessed March 2016]
[4]. TB Alert 'Diagnosis' [accessed March 2016]
[5]. NHS Choices (2014, December) 'Tuberculosis (TB) - Treating tuberculosis'
[6]. TAG (2014, May) 'An Activist's Guide to Tuberculosis Drugs'
[7]. TB Alert 'Treatment' [accessed March 2016]
[8]. a.b.CDC (2012) 'Basic TB Facts'
[9]. a.b.CDC (2013, March) 'HIV and Tuberculosis Fact Sheet'
[10]. TB Alert 'Prevention' [accessed March 2016]
[11]. a.b.TB Alert 'TB and HIV' [accessed March 2016]
[12]. Glynn JR. Resurgence of tuberculosis and the impact of HIV infection. BR Med Bull 1998.
[13]. Egbe, C.A., Ndiokwere, C. and Omoregie, R.(2011). Microbiology of Lower Respiratory Tract Infections in Benin City. Nigeria. *Malays Journal of Medical Science 18:27-31*
[14]. Elliot AM, Halwindi B, Hayes RJ, Luo N, Mwinga AG, Tembo G, Machiels L, Steenbergen G, Pobee JO, Nunn PP, et al. The impact of human immunodeficiency virus on response to treatment and recurrence rate in patients treated for tuberculosis: two-year follow-up of a cohort in Lusaka, Zambia. J Trop Med Hyg 1995;98:9-21.
[15]. Getahun H, Gunneberg C, Granich R, Nunn P (2010) HIV infection-associated tuberculosis: the epidemiology and the response. Clin Infect Dis 50: Suppl 3S201–S207.
[16]. Selwyn PA, Hartel D, Lewis VA, Schoenbaum EE, Vermund SH, et al. (1989) A prospective study of the risk of tuberculosis among intravenous drug users with human immunodeficiency virus infection. N Engl J Med 320: 545–550.
[17]. Nigeria TB fact sheet under the USA embassy in Nigeria 2011.
[18]. Srirangaraj, S. and Venkateska, D. (2011). Opportunistic infections in relations to antiretroviral status among AIDS patients from South India . *Indian Journal of medical microbiology* 29:395-400.
[19]. Jensen PA, Lambert LA, lademarco MF, Ridzon R; Centers for Disease Control and Prevention. Guidelines for preventing the transmission of Mycobacterium tuberculosis in health care settings, 2005. MMWR Recomm Rep. 2005;54(RR-17):1-14.
[20]. Frieden TR, Sterling TR, Munsiff SS, Watt CJ, Dye C. Tuberculosis. Lancet. 2003;363:887-899.
[21]. American Thoracic Society and Centers for Disease Control and Prevention. Diagnostic standards and classification of tuberculosis in adults and children. Am J RespirCrit Care Med.. 2000;161(4 pt 1):1376-1395.
[22]. Centers for Disease Control and Prevention. TB elimination: the difference between latent TB infectsion and active TB disease. 2008.
[23]. Bellamy R, Ruwende C, Corrah T, McAdam KP, Whittle HC, Hill Av. Variations in the NRAMP1 gene and susceptibility to tuberculosis in West Africans. N Engl J Med 1998;33:640-644.
[24]. Moller M, Hoal EG (2010) Current findings, challenges and novel approaches in human genetic susceptibility to tuberculosis. Tuberculosis (Edinb) 90: 71–83.
[25]. Hassim S, Shaw PA, Sangweni P, et al. Detection of a substantial rate of multidrug-resistant tuberculosis in an HIV-infected population in South Africa by active monitoring of sputum samples. Clin Infect Dis. 2010 Apr 1;50(7):1053-9.
[26]. Cain KP, McCarthy KD, Heilig CM, et al. An algorithm for tuberculosis screening and diagnosis in people with HIV. N Engl J Med. 2010 Feb 25;362(8):707-16.
[27]. Jones BE, Young SM, Antoniskis D, et al. Relationship of the manifestations of tuberculosis to CD4 cell counts in patients with human immunodeficiency virus infection. Am Rev Respir Dis 1993;148:1292-127.
[28]. Monkongdee P, McCarthy KD, Cain KP, et al. Yield of acid-fast smear and mycobacterial culture for tuberculosis diagnosis in people with human immunodeficiency virus. Am J RespirCrit Care Med. 2009 Nov 1;180(9):903-8.
[29]. Kennedy DJ, Lewis WP, Barnes PF. Yield of bronchoscopy for the diagnosis of tuberculosis in patients with human immunodeficiency virus infection. Chest 1992;102:1040-1044.
[30]. Chamie G, Luetkemeyer A, Walusimbi-Nanteza M, et al. Significant variation in presentation of pulmonary tuberculosis across a high resolution of CD4 strata. Int J Tuberc Lung Dis. 2010 Oct;14(10):1295-302.
[31]. Greenberg SD, Frager D, Suster B, et al. Active pulmonary tuberculosis in patients with AIDS: spectrum of radiographic findings (including a normal appearance). Radiology 1994;193:115-119.
[32]. Long R, Maycher B, Scalcini M, et al. The chest roentgenogram in pulmonary tuberculosis patients seropositive for immunodeficiency virus type-1. Chest 1991;99:123-127.
[33]. Bigwan E.I, Ohaeri M.C, Vem T.S, Sheyin Z, Umar A, Olukose O.J, Wuyep P, Gyang B, Chollom S.C, Socio-eceonomic dependence on the incidence of tuberculosis in Jos, North central Niegrai. Science journal public health VOl 1, No5, 2013, pp. 235-238
[34]. Taura D.W, Sale IT and Mohammed Y. Prevalence of patients attending the infectious disease hospital, Kano Nigeria int. Jor.p. APP. 5cs2(3):63-69.2008.
[35]. Imam, T.S and Oyeyi, T.I. restrospective study pulmonary tuberculosis prevalence among patients attending infectious disease control hospital in Knao 2008. Nigeria report on TB 2013.
[36]. NdalilnaiiyaEndie, Simon Cadmus, Patrick Nguku, OlunfumilayoFawole, OlajideAdewole, Hyeshihuwaziri, Luka Ibrahim, oladayoBiya, SaledGidado, Samuel Badung, PetersideKumbish and Peter Nsubugu. Factors associated with TB among patients attending treatment center in zaria 2010.
[37]. Atana Uket Ewa, Dominic Fabian Essiet, Samuel John UmejeiMonu. Tuberculosis in children living amongst adults tuberculosis at the uberculosis and leprosy referral hospital, Eku, Nigeria 2015
[38]. Christopher C. Affusim, EmekaKesiemeans Vivian O. Abah. The pattern of presentation and prevalence of tuberculosis in HIV seropositive patients seen at Benin City Nigeria 2011.
[39]. Olaitan O.L. Prevelance of HIV infection in patients with tuberculosis in Ibadan Oyo State 2000-2004.
[40]. Shama, S.K. Kadhiravan, T. Banga, A., Goyal, T., Btatca. Spectrum of Clinical Disease in a Series of 135 Hospitalised HIV-Infected Patients from North India. *BMC Infectious Diseases 4:52.* 2004.
[41]. Komati, S., Shaw, P.A., Stubbs, N., Mathibedi, M.. J. and Malan, L. Tuberculosis Risk Factors and Mortality for HIV-Infected Persons Receiving Antiretroviral Therapy in South Africa. *AIDS* 24:1849-1855.2010.