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**PREVALENCE OF ACID-ALCOHOL-FAST BACILLI AMONG PATIENTS WITH SUSPECTED CASES OF PULMONARY TUBERCULOSIS IN JOS, NIGERIA**

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\*Correspondence: Phone number 08037876097; E-mail [emabigwan@yahoo.com](mailto:emabigwan@yahoo.com)**ABSTRACT**

Mycobacterium tuberculosis is a major public health problem in globally due to its high tendency of person-person transmission, morbidity, and mortality. This study aimed at determining the prevalence of AAFB within the study area. Sputum samples were collected from three hundred and three (303) patients with suspected cases of pulmonary tuberculosis attending Plateau State Specialist Hospital and Faith Alive Foundation. The samples were examined using Ziehl Neelsen method. Structured questionnaires were administered to obtain some demographic data from patients that consented. Results were tested statistically for significance at  $p < 0.05$  using Chi-square test. Out of the samples examined, 29 (9.57.0%) were positive for AAFB. The study showed that the prevalence of smear-positive increased with age between 15 and 45 and then decreased from age groups 46 and above. The study also revealed that males had a higher prevalence with 19 (12.34%) than females who had 10 (6.71%). Marital status showed that divorced individuals had the highest prevalence of 2 (12.50%) followed by married, singles and the widowed with 18 (11.76%), 8 (6.34%), and 1 (5.90%) respectively. Statistically the study reveals that age groups, sex, hospital (location) does not have any effects on the prevalence ( $p > 0.05$ ) while marital status showed a significant effect on the prevalence ( $p < 0.05$ ). There is need for a more collaborative efforts and political will by the government and non-governmental agencies in order to fast track prevention and control measures aimed at eliminating the infection in the nearest future.

Key words: AFB, Tuberculosis, Jos, Nigeria.

**PREVALENCE DE BACILLES ACIDO-ALCOOLO-RESISTANTS CHEZ LES PATIENTS AVEC DES CAS PRESUMES DE TUBERCULOSE PULMONAIRE A JOS, AU NIGERIA**

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\* Adresse Mail d'auteur correspondant: Téléphone : 08037876097, E-mail [emabigwan@yahoo.com](mailto:emabigwan@yahoo.com)**RÉSUMÉ**

Mycobacterium tuberculosis est un problème majeur de santé publique dans le monde en raison de sa forte tendance de transmission de personne en personne, la morbidité et la mortalité. Cette étude vise à déterminer la prévalence de BAAR dans la zone d'étude. Les échantillons d'expectorations ont été recueillis à partir de trois cent trois (303) patients avec suspicion de tuberculose pulmonaire qui fréquentent l'hôpital Spécialiste de l'Etat du Plateau et la Fondation Foi Vivante. Les échantillons ont été examinés en utilisant la méthode de Ziehl Neelsen. Des questionnaires structurés ont été administrés pour obtenir des données démographiques des patients ayant consenti. Les résultats ont été testés statistiquement à  $p < 0,05$  au test du chi - carré. Sur les échantillons examinés, 29 (9.57.0%) étaient positifs pour BAAR. L'étude a montré que la prévalence des frottis positif augmente avec l'âge entre 15 et 45, puis a diminué de groupes d'âge 46 et plus. L'étude a également révélé que les mâles avaient une prévalence plus élevée de 19 (12,34%) que les femmes qui avaient 10 (6,71%). L'état civil a montré que les personnes divorcées ont la plus forte prévalence de 2 (12,50%), suivie par les mariés, les célibataires et les veuves avec les valeurs de 18 (11,76%), 8 (6,34%), et 1 (5,90 %) respectivement. Statistiquement l'étude révèle que les groupes d'âge, le sexe, l'hôpital (lieu) n'a pas d'effets sur la prévalence ( $p > 0,05$ ), tandis que l'état matrimonial a montré un effet significatif sur la prévalence ( $p < 0,05$ ). Il est nécessaire d'implémenter d'efforts pour une grande collaboration entre la volonté politique du gouvernement et des organismes non gouvernementaux afin de prendre des mesures de prévention de la voie rapide et de contrôle visant à éliminer l'infection dans un proche avenir.

Mots clés: AFB, la tuberculose, Jos, Nigeria.

**INTRODUCTION**

Tuberculosis (TB) remains a major cause of illness and death worldwide, especially in Asia and Africa. Globally, there were an estimated 9.2 million new cases and 1.7 million deaths from TB in 2006 (1). Although the control of TB has improved dramatically in most industrialized countries during the century, the disease continues to be a major cause of morbidity and mortality in developing countries (2). The World Health Organization (WHO) estimates that 22 countries account for 80% of all new cases and 98% of all deaths from TB, a situation that is exacerbated in countries with high rates of HIV infection (1).

The causative agent of this dreaded infectious disease is called *Mycobacterium tuberculosis* discovered in 1882 by Robert Koch (3). Tuberculosis most often affects the lungs, it is curable, preventable and is spread from person to person through the air. When people with lung TB cough, sneeze or spit, they propel the TB germs into the air. A person needs to inhale only a few of these germs to become infected. Common symptoms of active lung TB are cough with sputum and blood at times, chest pains, weakness, weight loss, fever and night sweats (4).

About one-third of the world's population has latent TB, which means people have been infected by TB bacteria but are not (yet) ill with disease and cannot transmit the disease. When a person develops active TB (disease), the symptoms (cough, fever, night sweats, weight loss etc.) may be mild for many months. This can lead to delays in seeking care, and results in transmission of the bacteria to others. People ill with TB can infect up to 10-15 other people through close contact over the course of a year. Without proper treatment up to two thirds of people ill with TB will die. TB occurs in every part of the world. In 2010, the largest number of new TB cases occurred in Asia, accounting for 60% of new cases globally. However, Sub-Saharan Africa carried the greatest proportion of new cases per population with over 270 cases per 100 000 population in 2010 (4).

Nigeria ranks fifth among the world's high-burden countries, with a prevalence of tuberculosis (TB) cases of 280,000. The TB prevalence is at 171/100,000 and the incidence rate of sputum smear positive disease is approximately 118/100,000 (5)

Tuberculosis (TB) is a serious public health concern globally, and almost half of new infections are undetected (1). Tuberculosis bacteriology is one of the fundamental aspects of a national tuberculosis control programme and a key component of the DOTS strategy, yet the tuberculosis laboratory service is often the most neglected component of these

programmes (6). The use of smear microscopy in patients suspected of tuberculosis presenting to health services is of great value in case detection and in reducing the spread of the infection throughout the population by treatment of such cases (7).

Rapid and accurate diagnosis of symptomatic patients is the cornerstone of global TB control strategies. Remarkable progress has recently been made upgrading the speed and quality of TB diagnostic services in developed countries but for most of the world where TB is a large public health burden, these gains are still unrealized (8). Thus, the primary laboratory tool supporting case detection in vast majority of cases in disease endemic countries remains microscopic examination of the stained sputum smear. The shortcomings of this method seriously limit the extent and quality of its application, and ultimately, its impact in TB control (9)

This study aimed at determining the prevalence of AAFB in patients with suspected cases of *Mycobacterium tuberculosis* in the study area.

## **MATERIALS AND METHODS**

### **STUDY AREA**

Plateau State is the twelfth largest state of Nigeria, and is roughly located in the center of the country. It is geographically unique in Nigeria because its boundaries totally surround the Jos Plateau, having the Jos Plateau totally in its central and northern part. Its capital is Jos. Plateau State is located in Nigeria's middle belt. With an area of 26,899 square kilometres, the State has a population of 3,178,712 people according to 2006 census. It is located between latitude 8°24'N and longitude 8°32' and 10°38' east. Though situated in the tropical zone, a higher altitude means that Plateau State has a near temperate climate with an average temperature of between 18 and 22°C. Harmattan winds cause the coldest weather between December and February. The mean annual rainfall varies from 131.75 cm (52 in) in the southern part to 146 cm (57 in) on the Plateau (10).

The main occupation in the rural areas is farming, while those in urban areas are civil servants, traders and students. The two tertiary hospitals Jos University Teaching Hospital (JUTH) and Plateau Specialist Hospital (PSSH) serve as referral centers for the primary and secondary health care facilities in the area. Plateau State Specialist Hospital and Faith Alive Foundation (FAF) are situated within Jos city and they serve patients mostly within the state.

**ETHICAL CONSIDERATION**  
Ethical clearances were obtained from Jos University

Teaching Hospital, Jos, Plateau Specialist Hospital, and Faith Alive Foundation before the commencement of the work.

**STUDY**

The study population focused on all Patients within the age range 15 years and above with suspected cases of pulmonary tuberculosis attending Plateau Specialist Hospital, and Faith Alive Foundation.

**SAMPLING**

A structured questionnaire was administered randomly to patients who gave their consent in order to obtain some useful bio-data.

**SAMPLE**

The sample collection were done with the assistance of Medical personnels. The patients were given sterile universal bottles in which they produced three samples (one spot, one early morning and one spot).

**SAMPLE**

Three consecutive sputum samples were collected in leak proof universal plastic containers and stained using Ziehl-Neelsen’s method and examine in accordance with standard methods (11). Three smears were prepared from each patient, heat fixed and stained using Ziehl-Neelsen technique as follows: Strong carbol fuchsin was flooded on the slides and steamed, it was then allowed to stain for 5 minutes followed by decolourization with 3% acid-alcohol and washed with water and then counterstained with 0.3% methylene blue for 1 minute, washed with water and allowed to air-dry before examination for AAFB.

**MICROSCOPIC EXAMINATION OF SLIDES**

The stained smears were examined with the Olympus light, binocular microscope under the oil immersion objective, scanning all fields at high power field for the presence of bright red slender rods, the presence of which signified positive AAFB and the absence, negative. The microscopy revealed the tubercle bacilli being bright red on a blue background; straight or slightly curved, quite short (1-4µm) often granular, arranged in groups of 3-10 bacilli close together like bits of string.

**GRADING OF MICROSCOPY RESULTS**

This was done in accordance to standard method as shown below:

- 1-9/100 fields - 1+
- 1-9/10 fields - 2+
- 1-9/1 field - 3+
- 9/1 field - 4+

**Negative - 0.**

**RESULTS**

Three hundred and three (303) sputum samples were examined for AAFB from the study area. Out of the 303 sputa, 29 (9.57%) were positive for AAFB. The prevalence of AAFB in relation age groups as shown in table 1. The age group 36-45 had the highest prevalence with 9(13.85%), followed by age group 46-55 with a prevalence of 4(11.43%), while the age groups 56 and above had the least. Statistical analysis reveals that age does not have a significant relationship with the prevalence (p > 0.05).

Table 2 shows the prevalence of AAFB in relation to Gender. The males had a prevalence of 19(12.34%) while females had 10(6.71%). This showed that gender does not have a significant effect in this association (p > 0.05).

The prevalence of AAFB in relation to marital status as shown in Table 3 reveals that divorced people had the highest prevalence with 2(12.50%), followed by the married, single and widowed with 18(11.76%), 8(6.34%) and 1(5.90%) respectively. This result showed a significant association (p < 0.05). The prevalence of AAFB in relation to hospital location as shown in Table 4 indicated that Plateau State Specialist Hospital(PSSH) had the highest with 17(11.56%) while Faith Alive Foundation(FAF) had 12(7.69%). The result showed that patients attending different hospital in the same area does not have any effects on the prevalence rate (p > 0.05).

**TABLE 1: PREVALENCE OF ACID-ALCOHOL-FAST BACILLI IN RELATION TO AGE**

Age	No. Screened	No. positive (%)	X <sup>2</sup> /P-Values
15 -25	2	6(9.70)	8.10; DF=4
26 -35	111	9(8.11)	P > 0.05
36- 45	65	9(13.85)	
46- 55	35	4(11.43)	
≥ 56	30	1(3.33)	
<b>Total</b>	<b>303</b>	<b>29(9.57)</b>	

**TABLE 2: PREVALENCE OF ACID-ALCOHOL-FAST BACILLI IN RELATION TO SEX**

Sex	No. Screened	No. positive (%)	X <sup>2</sup> /P-Values
Male	154	19(12.34)	X <sup>2</sup> =2.83; DF=1
Female	149	10(6.71)	P > 0.05
Total	303	29(9.57)	

**TABLE 3: PREVALENCE OF ACID-ALCOHOL-FAST BACILLI IN RELATION TO MARITAL STATUS**

Marital status	No.SCREENED	No.positive(%)	X <sup>2</sup> /P-Values
Single	117	8(6.34)	X <sup>2</sup> =25.21; DF=3
Married	153	18(11.76)	P < 0.05
Divorced	16	2(12.50)	
Widowed	17	1(5.90)	
Total	303	29(9.57)	

**TABLE 4: PREVALENCE OF ACID-ALCOHOL-FAST BACILLI IN RELATION TO HOSPITALS**

Hospital	No. Screened	No. positive (%)	X <sup>2</sup> /P-Values
FAF	156	12(7.69)	X <sup>2</sup> =0.89; DF=1
PSSH	147	17(11.56)	P > 0.05
Total	303	29(9.57)	

## DISCUSSION

The result obtained in this study reveals that out of the three hundred and three (303) sputum samples examined for AAFB using Ziehl Neelsen staining technique, 29(9.57%) were positive for AAFB. Considering the fact that sputum smear microscopy is less sensitive to sputum culture in tuberculosis diagnosis, and with the number of positivity obtained, it is obvious that the study area is endemic to tuberculosis. The result of this study agreed with earlier findings of a prevalence of 10.5% in Osogbo,

Southwestern Nigeria(12) , a prevalence of 12% in Zaria, North western Nigeria(13), a prevalence of 16.83% in some parts of Abia ,Southeastern Nigeria(14) and a prevalence of 7.1% was reported among suspected new tuberculosis patients attending University College Hospital Ibadan, Southwestern Nigeria(15) while a higher prevalence of 31.7% was reported in Southeastern Nigeria(16) which is far higher than what was obtained in this study.

This study indicates that most of the smear positive cases were within the age groups between 15 and 45years. This may be associated with the demands associated with these age groups, since these age groups constitute the most productive part of national development and their engagement in several activities may predisposes them to the infection. This study was in agreement with an earlier findings in Osogbo, Southwestern Nigeria which reported a highest prevalence among age group 16-30 while the age group 75 and above had the least (12), and a report from Southeastern Nigeria which stated that the prevalence of smear-positive pulmonary TB increased with age, up to the 41-50 years age category but decreased among patients who are 50 years and above (17).

The study shows that males had a higher prevalence 19(12.34%), while females had 10(6.71%).The results showed that there was no significant statistical association with the prevalence (p > 0.05).This study agreed with some earlier findings which reported a higher prevalence in males than females (12, 17, 18). The result may be attributed to a higher exposure of males to some risks factors associated with the transmission of the infection than in females.

The prevalence of AAFB in relation to marital status as seen in this study reveals that married people had the highest prevalence of 18(11.76%),followed by the divorced, singles and widowed with, 2(12%), 8(6.34%) and 1(5.90) respectively. The result of this finding indicates that people who are always in close contact or staying together in a household especially in endemic areas have a higher chances of contracting the infection.

The prevalence of AAFB in relation to hospital location as shown in this study indicated that Plateau State Specialist Hospital (PSSH) had the highest with 17(11.56%) while Faith Alive Foundation (FAF) had 12(7.69%).The result showed that patients attending different hospitals within the study area does not have any effects on the prevalence of the infection.

## CONCLUSION

The 9.57% prevalence of AAFB in the study area obtained using the Ziehl Neelsen method is an indication that the area is endemic to the spread and transmission of tuberculosis, although the method is less sensitive when compared with the cultural method, the method is still the main stay of diagnosis of AAFB among patients with suspected cases of pulmonary tuberculosis in the area. The need for provision of standard tuberculosis laboratories with modern facilities for cultures can not be over emphasized; this can further compliment the on going work in the Direct Observed Therapy Short course (DOTS) centres in the study area and hence improve health care delivery.

## RECOMMENDATIONS

In order to curtail the spread of AAFB, there is need:

1. For the establishment of standard tuberculosis laboratories with all the

required equipments, reagents and well trained personnel for both microscopy and culture

2. To create more awareness through campaigns on mode of transmission, risk factors and the prevention and control of the infection
3. There should be a political will and commitment at the different levels of government and NGOs on adequate funding of research, campaigns and implementation of the research findings with the aim of eliminating tuberculosis in Nigeria.

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## REFERENCES

1. World Health Organization. Global tuberculosis control: surveillance, planning, financing. Geneva: The Organization.2008.[http://www.stoptb.org/events/world\\_tb\\_day/2008/assets/documents/WHO\\_2008\\_global\\_TB\\_report.pdf](http://www.stoptb.org/events/world_tb_day/2008/assets/documents/WHO_2008_global_TB_report.pdf)
2. Dye C.,Watt C.J.,Bleed D.M.,Husseini S.M.,Raviglione M.C.Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence and deaths globally.JAMA 2005;293(22):2767-75
3. Arora D.R., Arora B.Mycobacterium tuberculosis. Textbook of Microbiology 3rd edition.CBS Publishers. New Delhi 290-305
4. WHO. Tuberculosis FACT SHEET 2011 PDF [http://www.who.int/tb/publications/2011/factsheet\\_tb\\_2011.pdf](http://www.who.int/tb/publications/2011/factsheet_tb_2011.pdf). Accessed 20th December, 2012
5. TB country profile preview TB-WHO Report2011 .Tuberculosis profile Nigeria2011. [https://extranet.who.int/sree/Reports?op=Replet&name=/WHO\\_HQ\\_Reports/G2/PR OD/EXT/TBCountry....](https://extranet.who.int/sree/Reports?op=Replet&name=/WHO_HQ_Reports/G2/PR OD/EXT/TBCountry....)Accessed 28th November, 2012
6. World Health Organisation. Laboratory services in tuberculosis control. Part I: organisation and management. Geneva:

- WHO, 1998.<http://wwwn.cdc.gov/dls/ila/documents/lstc1.pdf>.Accessed on 14th November, 2012
7. World Health Organisation. Global tuberculosis control: surveillance, planning, financing. Geneva, 2005. (WHO/HTM/TB/2005.349
8. Kehinde A.O., Obaseki F.A., Cadmus S.I.B., Bakare R.A. Diagnosis of Tuberculosis: Urgent Need to Strengthen Laboratory Services. Amer. J. of Nat. Med. Assoc. 2005, 97 (3): 394-396
9. Zyl-Smit R., Dheda K. Research Article Open Access Zyl-Smit and Dheda, Mycobact Diseases 2012, 2:2 <http://dx.doi.org/10.4172/2161-1068.1000e111>
10. [http://en.wikipedia.org/wiki/Plateau\\_State](http://en.wikipedia.org/wiki/Plateau_State) Accessed 15th January, 2013
11. World Health Organization.TB monitoring, No. 30 strategy and Operation monitoring and evaluation.WHO, 2004. <http://www.who.int/gtb/en>.Accessed 24th June, 2009
12. Olowe O.A., Famojuro H.B.Laboratory Identification of Pulmonary TB using simple rapid techniques in Osogbo South Western Nigeria. Res. J. of Med. Sci .2010; 4(3):227-230
13. Ogboi S. J., Idris S. H., Olayinka A. T., Junaid I.Socio-demographic characteristics of patients presenting pulmonary tuberculosis

- in a primary health centre, Zaria, Nigeria. *J. of Med. Lab. and Diag.* 2010; 1(2):11-14. Available online <http://www.academicjournals.org/IMLD>
14. Nwachukwu N.C., Orji, A., Kanu I.O. Epidemiology of Pulmonary Tuberculosis in some parts of Abia State, Federal Republic of Nigeria. *Asian J. of Epidemiol.* 2009; 2(1):13-19
  15. Aderemi O.K., Obaseki F.A., Ishola, O.C., Ibrahim, K.K. Multi drug Resistance to Mycobacterium tuberculosis in a tertiary Hospital. *J. of the Med. Assoc.* 2007; 99(10):1185-1189
  16. Itahl A.Y., Udofia S.M. Epidemiology and Endemicity of Pulmonary Tuberculosis in Southeastern Nigeria. *Southeast Asian J Trop Med Public Health.* 2005; 36(2):317-23
  17. Uneke C.J., Alo M.N. Rising cases of smear-positive pulmonary tuberculosis in southeastern Nigeria: the public health implication. *Afr. J. of Resp. Med.* 2006; 1:11-14
  18. Imam T. S., Oyeyi T.I. A Retrospective Study of Pulmonary Tuberculosis (PTB) Prevalence Amongst Patients Attending Infectious Diseases Hospital (IDH) In Kano, Nigeria. *Bayero J. of Pure and Applied Sci.* 2008; 1(1):10 - 15