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Pulmonary and Rifampicin-Resistant Tuberculosis Associated with Human Immunodeficiency Virus Infection Prevalence in Bayelsa State, Nigeria: A Case of Patients Attending Federal Medical Centre Yenagoa

Nsikak Godwin Etim[*], Frankland Oyeins Briyai

Department of Biological Sciences, Niger Delta University, Wilberforce Island, Nigeria

Email address:
etimnsikak2@gmail.com (N. G. Etim)
[*]Corresponding author

Abstract: This study investigated the prevalence of pulmonary tuberculosis (PTB) associated human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDs) infection among patients attending Federal Medical Centre Yenagoa, Bayelsa state, Nigeria. Out of the 456 subjects recruited for the study, 88 patients (comprising of male and females) with known cases of PTB was studied for the association of HIV with PTB. Blood and sputum samples were collected following standard procedure. HIV/AIDS was determined following serial all logarithm test viz: Determine, Unigold, Stat pack, while the PTB and rifampicin resistant tuberculosis (RMPR – TB) was analyzed using GeneXpert System. Results showed that 41(9.0%) and 47 (10.3%) was seropositive and seronegative to HIV/AIDS. There was no significant difference (P>0.01) among the serotypes/groups. Also 0.7% of the PTB subjects with HIV were resistant to rifampicin. Therefore, there is the need for surveillance of drug resistance in tuberculosis which could lead strengthening of laboratory networks and enhance its prevention and control.

Keywords: HIV/AIDS, Prevalence, Rifampicin-Resistant Tuberculosis, Tuberculosis

1. Introduction

Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) and Tuberculosis (TB) is a major disease burden in the world especially in developing countries. Acquired immunodeficiency syndrome (AIDS) and TB is a viral and bacterial disease caused by human immunodeficiency virus (HIV) and *Mycobacterium tuberculosis* (MTB) respectively. Unlike HIV/AIDs, TB is a communicable disease which is transmitted from the aerolization of cough, sneezing and spitting of an infected person. While HIV is transmitted through sexual intercourse, blood transfusion, piercing of unsterilized sharp objects, mother to her newborn through breast feeding. Both TB and HIV/AIDs affect the immune system of infected person. In HIV patients, the helper T cells such as CD4^{+} are lowered [1] and this could lead to loss of cell-mediated immunity making the body susceptible to opportunistic infections.

Globally, the prevalence of HIV infection has been increasing. For instance, between 2010 to 2016 the infection increased from 33.2 million to 36.7 million (including 1 million death in 2016) making it among the leading cause of mortality worldwide [2, 3]. HIV tends to have higher effected on individuals within the reproductive age. For instance, a global prevalence of 0.8% increase from 2001 to 2016 among individual within the age grade of 15 – 49 [2, 3].

Like HIV, TB is also a major cause of mortality especially in low and middle income countries. The prevalence of TB have is also in increasing trend. Approximately 10.4 million contacted TB leading to 1.8 million death (comprising of 0.4 million among people with HIV) worldwide in 2015 [4]. This value is higher than 9.0 million TB cases reported by WHO

in 2014 [5]. About 87% of global TB new cases occur in 30 TB high burden nations. Of these 6 countries including Nigeria and South Africa (Africa Continent), China, India, Pakistan and Indonesia (Asia) accounts for about 60% of total case [4]. As such, TB is one of the infectious diseases causing mortality and morbidity in the world especially in developing nations [6 – 8].

HIV infection has increased the prevalence of global TB especially in Africa [3, 4]. Typically, MTB co-inhabit with humans affecting about 3 billion people globally and about 10% developing clinical disease [9]. For instance, 35% of HIV death in 2015 was due to TB [9]. Beside the health, HIV also impact on households, communities, and development and economic growth of countries [9]. Nations that are affected by HIV also suffer from other infectious diseases, food insecurity, and other serious difficulties [9].

The effect of HIV on the global TB pandemic is very momentous [1]. Before the discovery of HIV, TB prevalence rate have decreased and the means of acquiring the infection is mostly due to pulmonary [1]. This suggests that HIV and TB have synergist effect. Both HIV and TB have an impact on immune system as such if not early detected it could leading to premature death. Furthermore, co-infection of TB and HIV could deactivating the hosts' immune system [1]. HIV enhances the progression of TB latent infection to active disease and the decline of TB in previously treated patients [10].

TB is among the leading cause of death in HIV infected patients [10]. Different type of TB associated with HIV infection exists. In a study conducted in Benin city, Edo state, PTB is the commonest type of TB among HIV patients accounting for 78.6% as against and extra-pulmonary TB condition which accounted for 21.4% [11]. Extra-pulmonary organs that are affected by tuberculosis include brain, genitourinary spine and lymph nodes though their prevalence is insignificant compared to PTB in most TB burden nations. The occurrence of MTB-HIV co-infections poses peculiar diagnostic and therapeutic challenges [1]. Due to the effect of possible co-infection of PTB-HIV, several studies have been conducted to this regard in several part of Nigeria including sub urban area of Ikenne Local government [1], Abeokuta, Ogun state [12], Abia state [13], rural eastern Nigeria[10], Edo state [14], Ile-Ife, Osun state [15, 16], Lagos [17], Sagamu [18], Kano [19]. But information in Yenagoa metropolis is scanty in literature. Therefore this present study aimed at assessing Prevalence of Pulmonary tuberculosis associated HIV/AIDs infection among patients attending Federal Medical Centre Yenagoa, Bayelsa state, Nigeria

2. Materials and Methods

2.1. Study Area

Yenagoa is the capital of Bayelsa state, Niger Delta region of Nigeria. The area lies in the sedimentary basin and fishing is the major source of livelihood of the indigenous people of the state. Civil servant and businesses is the major occupation

of people in the area [20]. Like other region of the Niger Delta, two predominant seasons viz: wet (April to October -7 months) and dry (November to March of the following year) [21]. But in the recent times, it appears that rainfall pattern in beginning to shift from the known conventional period [22]. The climatic condition of the area is characterized by 28 ± 6°C and 50 – 95% temperature and relative humidity respectively [23].

2.2. Study Population (Participants)

A total of 456 patients were screened and 88 subjects (19.3) (including male and females) within the age grade of 2 – 78 years were positive to PTB hence participated in the study [24]. The participant showed symptom of tuberculosis and were confirmed with GeneXpert System. Individuals that showed symptoms of tuberculosis such as persistence cough for at least 2 weeks, weight loss, night sweat, swelling at the neck, hand or armpit and fever with any of the above and they were tested negative to TB was excluded in the study.

2.3. Sample Collection

The blood sample was collected placing a tourniquet was wrapped around subjects upper arm [25]. Then the needle site was cleaned with 70% alcohol. The needle was put into the vein. A vacutainer tube was attached to the needle to fill it with blood [25]. The band was removed from subject's arm when enough blood was collected [25]. A cotton ball was put over the needle site as the needle was removed. Pressure was put on the site and then a bandage put on. While the sputum sample was collected with a wide mouth leak-proof container for adult, gastric lavage was collected by the pediatricians in children.

2.4. Sample Collection

2.4.1. HIV Status Determination

The blood was screened for HIV following WHO standard of serial all logarithm test method viz: Determine, Unigold, Stat pack. Screening test was carried out using determine HIV kit, then after, reactive sera were further tested using Unigold HIV kit and Stat-Pack was used for inconclusive result and serves as tie-breaker [13]. In the determine test kit, 50µl of the blood sample was added to the sample pad and a drop of chase buffer was added after 60 seconds. Result was read after 15 - 60 minutes with positive result showing red bar in both patient and control window, and negative result is indicated by red bar and no red bar in the control and patient window.

In the Uni-gold test, 60µl of the sample was added to the sample pad and 2 drop of wash solution was added to the sample port. Result was read after 15 - 60 minutes with reactive resulting showing 2 pink/red lines of any intensity in the device window, (test window and control window), and non-reactive result was indicated by pink/red and no line in the control and test window respectively.

In the Stat-Pak test, 5µl of blood was into the sample pad and 3 drops of running buffer was added into the sample

well. Result was read off after 10 minutes. Reactive result was indicated by presence of 2 pink/purple lines of any intensity in the device window (test window and control window) and non-reactive result was indicated by pink/purple and no line in the control window and test window respectively.

2.4.2. Pulmonary Tuberculosis Determination

GeneXpert System that has modules thermal and optical system, cartridge self-contained disposable, computer system software barcode scanner and optional accessories like printer and UPS was used for the determination of tuberculosis in the subjects. The system was carried out based on manufacturers' instruction and has been applied in some studies [26]. The system simultaneously determined the presence and absence of MTB and rifampicin resistance MTB.

2.5. Statistical Analysis

SPSS version 20 was used to carry out the statistical analysis. The data was subjected to test for significance at α = 0.05.

3. Results and Discussion

Based on the result of previous earlier study, the prevalence of PTB and rifampicin resistance tuberculosis (RMPR-TB) among patient attending TB clinic at Federal Medical Centre Yenagoa was 19.3% and 2.4% between June to December 2015 in a total population of 456 [24]. Based on these values, the prevalence rate of HIV/AIDS and RMPR-TB among the HIV patients was determined and presented in

Figure 1. Among the 88 subjects (19.3%) and 11 (2.4%) PTB and [24], 41(9.0%) and 47 (10.3) was seropositive and seronegative to HIV/AIDS, being not significantly different (P>0.05) among the serotypes/groups. Furthermore, 3(0.7%) and 8(1.8%) were observed to be Seropositive and Seronegative subjects respectively to RMPR-TB. Statistics showed that there was significant difference (P<0.05) among the both serogroup in RMPR-TB positive to HIV. The co-infection prevalence of TB and HIV reported in this study had some similarity with the findings of other authors in different part of Nigeria. For instance, authors have reported PTB - HIV prevalence rate of 5.3% in Lagos state [17], 2.8% in Abeokuta, Ogun state [27], 10.8% in Irrua and 9.2% in Benin city, Edo state [14], 13.5% in Lagos [28], 0.6% in rural eastern Nigeria [10], 13.9% in patients attending Obafemi Awolowo University Teaching Hospital Complex Ile-Ife [16], 12.7% in Ile-Ife, Osun state [15], 10.5% in patients attending Aminu Kano Teaching Hospital, Kano [19], 14.9% in DOTS programme of the TB and leprosy control centre, Olabisi Onabanjo University Teaching Hospital, Sagamu [18], 16.6% in wale, Agbor and Eku in Delta State [29].

The variation among co-infection of HIV and TB patient could be associated to differences in behavioral factors, ignorance/ educational status, and poverty level in different geographical locations [1, 29]. The authors further reported that variation could be due to life style such as practice of polygamy, patronize of traditional birth attendant, poor sanitary/ hygiene practices and crowded environment. The high prevalence of PTB - HIV co-infection that occurs in area could be due to high level of poverty and destitute [15, 16]. Furthermore, the immune system of the patient also play essential role in PTB - HIV co-infection [16].
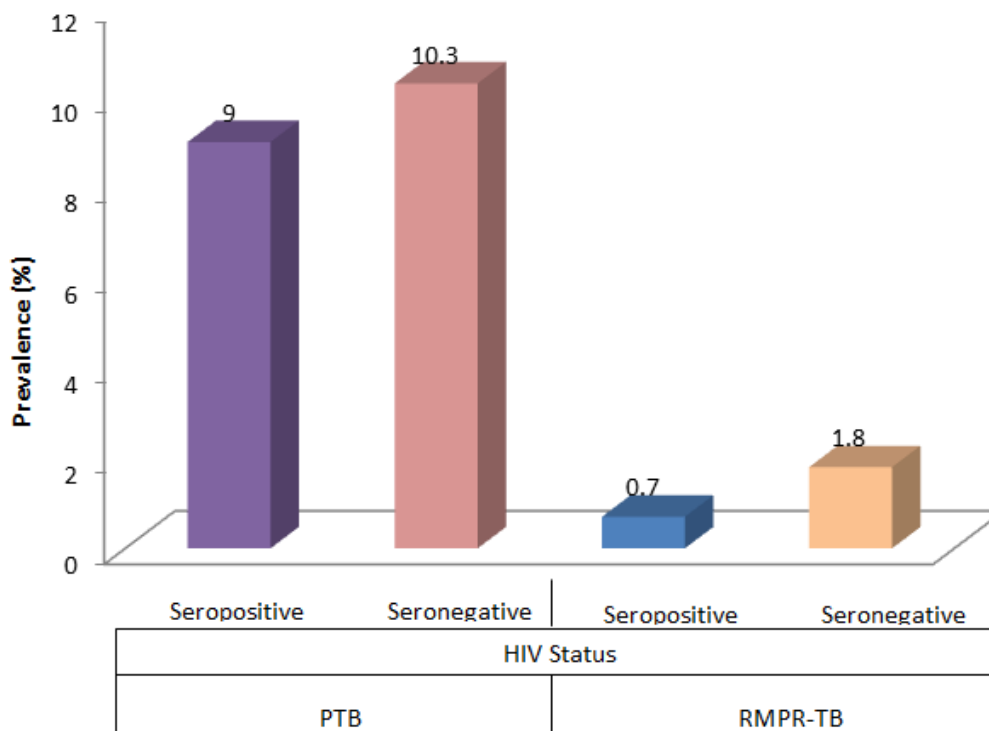

Figure 1. *Prevalence of both PTB and RMPR-TB based on HIV status among patient attending TB clinic in Federal Medical Centre, Yenagoa, Bayelsa state.*

The seropositive RMPR-TP among HIV/AIDS patient were low (0.7%). Though, the prevalence was higher than the prevalence of 0.15% reported in rural eastern Nigeria [10], and lower than 1.6% in Abia state [13], 6.7% in Abeokuta, Ogun state [27]. The value in this study is lower than the prevalence rate reported in other countries. For instance, a prevalence of 5.3% was reported in MDR-TB in seropositive patients in Addis Ababa, Ethiopia [30], 17.7% in PTB-HIV patients in India [31]. The high prevalence rate in India compared to the findings of this study could be due to the fact that India is the leading TB high burn nation [4]. The public health implication is to intensify equitable and unbiased search for resistant TB cases among smear negative and positive cases [13]. The occurrence of positive RMPR-TB in HIV patients is an indication of poor infection control and implementation in hospital setting [13].

4. Conclusion

This study evaluated the prevalence of PTB and RMPR-TB associated HIV/AIDS infection among patients attending TB clinic in Federal Medical Centre Yenagoa, Bayelsa state, Nigeria. The study found prevalence of 9.0% and 0.7% among PTB-HIV and RMPR-TB with HIV respectively. With the prevalence rate reported in this study, there is the need for surveillance of drug resistance in tuberculosis which could lead strengthening of laboratory networks, enhance the prevention and control of TB.

Ethical Approval

The experimental protocol was approved by the Ethics Committee of the Federal Medical Centre, Yenagoa, Bayelsa state, Nigeria.

Acknowledgements

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