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Pattern and Prevalence of HIV and Tuberculosis Infection in Port Harcourt Nigeria

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Abstract: **HIV and TB are infections are serious infections of major public health challenges globally, with serious socio-economic ramifications especially in low resource settings. The prevalence of HIV and TB in the Nigeria varies from region to region. This study was carried out to assess the prevalence of HIV and TB among patients attending tertiary hospitals in the Port Harcourt, Rivers State, Nigeria. Six hundred and twenty two subjects referred for HIV and TB testing in the University of Port Harcourt and Braithwaite Memorial Specialist Hospital were recruited into the study. Sputum and blood samples were collected and analyzed using standard methods. The results showed that 49.7% had HIV infection, 16.9% had HIV/TB coinfection, 6.6% had TB infection; 26.8% did not neither HIV nor TB. The occurrence of HIV among the male and female subjects was significant (χ^2= 15.39, *p* <.0001). The mean age of the subjects is as follows; HIV (36.2 ± 11.1 years), TB (40.8 ± 12.7 years), HIV/TB (39.8 ± 11.7 years) and No infection (38.3 ± 17.9 years). The mean CD4 counts in the subjects is as follows; HIV (367.7 ± 256.2), TB (318.6 ± 260), HIV/TB (178.0 ± 162) and No infection (638.5 ± 244). The difference in the CD4 count between infected persons and non-infected persons was statistically significant (p < 0.0001). The study shows HIV and TB is prevalent among young people; there is need for improved prevention and control of HIV and TB in Port Harcourt.**

Keywords: **HIV, TB, Co-Infection, Rivers East, Prevalence.**

1. INTRODUCTION

The Human Immunodeficiency Virus (HIV) and Tuberculosis (TB) are independently major public health challenges especially in developing countries such as Nigeria [1,2]. HIV infection has serious implications on the physical, physiological and socio-economic wellbeing of infected individuals [3]. It is estimated that above 3 million people live with HIV in Nigeria with a resultant mortality of about 5.1% [3, 4]. The prevalence of HIV has also exacerbated the burden of TB in the country [4]. About 1/3rd of the global population is estimated to be infected with TB with new infections occurring every second [5]. Nigeria is among the 22 countries with high TB burden, with an estimated incidence of 320/100,000 [5]. HIV infection also compounds the TB burden, with a 19.1% prevalence of HIV among TB infected patients recorded in 2010, an indication that the TB burden in the country may be influenced by HIV infection [6]. HIV infected persons are the most vulnerable to TB infection due to suppressed immunity, with an incidence of about 26% [7]. The prevalence of HIV and TB coinfection have mitigated efforts of treatment, control and prevention across the country [8]. This study was carried out to assess the pattern and prevalence of HIV and TB infections in Port Harcourt, the administrative and commercial nerve center of Rivers state, Nigeria.

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2. METHODOLOGY

2.1 Study Area:

The study was carried out in at the Braithwaite Memorial Specialist Hospital and The University of Port Harcourt Teaching Hospital in Port Harcourt. The area is the administrative and commercial nerve center of Rivers State, Nigeria.

2.2 Study Population:

Six hundred and twenty-two (622) individuals referred for HIV and TB testing at the University of Port Harcourt Teaching Hospital and Braithwaite Memorial Specialist Hospital between January and June, 2015 were consecutively recruited for the study.

2.3 Ethical Consideration:

Ethical approval to conduct the study was obtained independently from the Ethics Committees of the University of Port Harcourt Teaching Hospital and Braithwaite Memorial Specialist Hospital. Willful informed consent was also obtained from each subject before they were included for the study.

2.4 Sample Collection:

Three milliliters of venous blood was collected from each subjects in a vacutainer, properly labelled and stored prior to analysis. A sterile sputum cup was also used to collected sputum samples from the subjects according to WHO recommendations [4].

2.5 Sample Analysis:

Blood samples collected were tested for HIV using a rapid diagnostic ELISA kit according to the manufacturer's instruction. Sputum samples were subjected to Zeihl-Nelseen staining technique, viewed under the x100 objective of the microscope and TB diagnosis was made according to prescribed standards [9].

2.6 Data Collection:

Sociodemographic data of the subjects were retrieved from the admitting folders of the patients.

2.7 Data Analysis:

Data was analyzed with the Epi Info v7 software (CDC, USA). ANOVA and Mann-Whitney U test was used to compare the differences in Age and CD4 of the different groups of subjects. The Chi-square test was used to compare the prevalence of HIV and TB between both sexes. All tests were carried out at a 95% confidence interval; p-value < 0.05 was considered significant.

3. RESULTS

Table 1 contains the sociodemographic data of the subjects. There were 262 (42.1%) males and 360 (57.9%) females. Three hundred and thirty-three (53.5%) were married, 249 (40.0%) were single, while 40 (6.4%) were widowed. One hundred and twenty-six (20.3%) were civil servants, 102 (16.4%) were in private employment, 270 (43.4%) were self-employed, 84 (13.5%) were students while 40 (6.4%) were unemployed. One hundred and thirty-eight (22.2%) had completed primary education, 329 (52.9%) had secondary education, while 144 (23.2%) had tertiary education and 11 (1.8%) had no formal education.

Table1: Demographic Data

Variable	Frequency (n = 622)	Percentage (%)
Sex		
Male	262	42.1
Female	360	57.9
Marital Status		
Married	333	53.5
Single	249	40.0

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Widowed	40	6.4
Occupation		
Civil Servant	126	20.3
Private	102	16.4
Self Employed	270	43.4
Student	84	13.5
Unemployed	40	6.4
Education		
Primary	138	22.2
Secondary	329	52.9
Tertiary	144	23.2
None	11	1.8

Off the 622 subjects, 309 (49.7%) had HIV infection, 105 (16.9%) had HIV/TB coinfection, while 41 (6.6%) had TB infection and 167 (26.8%) had neither HIV nor TB infection (Table 2).

Table 2: Distribution of HIV and TB

Infection Type	Frequency (n)	Percentage (%)
HIV	309	49.7
HIV/TB	105	16.9
TB	41	6.6
No Infection	167	26.8
Total	**622**	**100.0**

Table 3 shows the distribution of HIV and TB by gender. Among male subjects, 106 (17.0%) had HIV infection, 22 (3.5%) had TB, 49 (7.9%) had HIV/TB coinfection, while 85 (13.7%) had no infection. Among female subjects, 203 (32.6%) had HIV infection, 19 (3.1%) had TB infection, 56 (9.0%) had HIV/TB infection while 82 (13.2%) had neither HIV nor TB infection. The occurrence of HIV among the male and female subjects was significant (= 15.39, p <.0001).

Table 3: Distribution of Infection by Gender

Infection Type	Male (n, %)	Female (n, %)	χ^2 (p-value)
HIV	106 (17.0)	203 (32.6)	15.39 (<0.0001)*
TB	22 (3.5)	19 (3.1)	2.39 (0.1216)**
HIV/TB	49 (7.9)	56 (9.0)	1.07 (0.3009)**
No Infection	85 (13.7)	82 (13.2)	7.21 (0.0072)*
Total	**262 (100.0)**	**360 (100.0)**	

χ^2Chi-square statistics; *statistically significant (p<0.05),
**statistically not significant (p > 0.05)

Table 4 shows the distribution of the different infections by Age groups. Among HIV-infected persons, 11(3.6%) were below 18 years, 96 (31.1%) were between 18-30 years, 151 (48.9%) were between 31-45 years, 36 (11.7%) between 46 – 55 years while 15 (4.9%) were above 55 years. Among the TB infected persons, 10 (23.3%) were between 18 – 30 years, 17 (39.5%) was between 31 – 45 years, 11 (25.6%) between 46 -55 years while 5 (11.6%) were above 55 years. Among the HIV/TB co-infected subjects, 3 (2.9%) were below 18 years, 25 (24.3%) were between 18 -30 years, 42 (40.8%) between 31 - 45 years, 26 (25.2%) between 46 – 55 years, while 7 (6.8%) was above 55 years.

Table 4: Distribution of Infection by Age Groups

Age group (years)	HIV (n, %)	TB (n, %)	HIV/TB (n, %)
<18	11 (3.6)	0 (0.0)	3 (2.9)
18 - 30	96 (31.1)	10 (23.3)	25 (24.3)
31 – 45	151 (48.9)	17 (39.5)	42 (40.8)
46 – 55	36 (11.7)	11 (25.6)	26 (25.2)
>55	15 (4.9)	5 (11.6)	7 (6.8)
Total	**309 (100.0)**	**43 (100.0)**	**103 (100.0)**

The mean CD4 counts in the subjects were as follows; HIV (367.7 ± 256.2), TB (318.6 ± 260), HIV/TB (178.0 ± 162) and No infection (638.5 ± 244). There was statistically significant differences in the Mean CD4 counts across the groups ($p < 0.05$). WBC in the study subjects are as follows: Control (6.5±3.6), HIV (5.5±2.5), TB (7.1±3.1) and HIV/TB (5.8±3.3). RBC include: 4.5±0.7 (control), 4.0±0.9 (HIV), 4.1±0.9 (TB) and 3.6±0.8 (HIV/TB). The PCV of the subjects were as follows; Control (36.2±10.1), HIV-infected persons (31.9±3.7), TB-infected subjects (30.2± 7.5) and HIV/TB co-infected subjects (3.6±0.8). ESR was 31.1±10.8 in control subjects, 71.5±45.2 (in HIV infected subjects), 91.1±42.7 (in TB) and 111.1±42.1 (in HIV/MTB). There was a statistically significant difference ($p < 0.0.5$) in the haematological indices of all the infected subjects when compared to the control subjects (Table 5).

Table 5: Haematological and immune status of Subjects

Haematogical Indices	Control	HIV	TB	HIV/TB	ANOVA
CD4 (cells/mm)	638.5 ± 244	367.7 ± 256.2[a]	318.6 ± 260[a]	178.0 ± 162[a]	<0.0001*
WBC (x 10^9/L)	6.5±3.6	5.5±2.5[a]	7.1±3.1[a]	5.8±3.3[a]	0.0054*
RBC (x 10^{12}/L)	4.5±0.7	4.0±0.9[a]	4.1±0.9[a]	3.6±0.8[a]	0.0123*
PCV (%)	36.2±10.1	31.9±3.7[a]	30.2±7.5[a]	28.3±7.8[a]	0.0214*
ESR (mm/hr)	31.1±10.8	71.5±45.2[a]	91.1±42.7[a]	111.1±42.1[a]	0.0001*

ANOVA: Analysis of Variance.
*Difference across the groups is statistically significant ($p<0.05$)
[a] Difference compared to 'Control' is statistically significant ($p<0.05$)

Table 6 shows the correlation of CD4 and selected haematological indices in the study subjects. There was a significant ($p < 0.05$) positive correlation of CD4 and PCV in the control, HIV, TB and HIV/TB subjects. The correlation of CD4 and RBC was also positively significant in all subjects, except in TB infected persons. There was a negative correlation of CD4 and WBC in the control subjects and TB subjects, while the correlation of WBC was positive in HIV and HIV/TB infected subjects. CD4 and ESR correlation were significantly negative in all the subjects.

Table 6: Correlation of CD4 and Haematological Indices in Subjects

Haematological Indices	Control	HIV	TB	HIV/TB
PCV	0.2*	0.3*	0.4*	0.5*
RBC	0.2*	0.1*	0.2**	0.4*
WBC	-0.05**	0.1**	-0.1**	0.02**
ESR	-0.5*	-0.5*	-0.4*	-0.6*

*Correlation is statistically significant ($p < 0.05$)
**Correlation is not statistically significant ($p > 0.05$)

4. DISCUSSION

The prevalence of HIV (49.7%) among the subjects is consistent with the findings of similar hospital-based studies which reported prevalence of HIV between 30 – 67% among similar study subjects [8, 10, 11]. TB was found in 16.9% of the subjects, while HIV/TB coinfection was seen in 26.8% of the subjects. The TB prevalence is similar to the reports of TB prevalence ranging from 14 – 22% in active case findings previously carried out in HIV endemic and high TB burden areas [8, 11].

Females were more significantly infected with HIV compared to male subjects, this could be attributed to high risk social behaviours and a relatively higher hospital attendance observed in women [12, 13]. The findings of the study is consistent with the WHO report which stated that 51% of adults infected with HIV were women [14]. Women have been reported to be more vulnerable to HIV infection in developing countries especially sub-Saharan Africa which account for at least more than 50% of the global HIV-infected population [15].

HIV and TB infections were significantly prevalent among the young population. This is consistent with the findings of related studies indicating that HIV and TB infection is consistently high among the young population [15-17]. The high prevalence of these infections among the young population has mostly been attributed to high risk social behaviours among young people. TB prevalence have also been shown to be exacerbated by the high level of HIV infection giving

rise to a significant prevalence of HIV/TB coinfection, especially in countries with a significant proportion of HIV infection and Transmission [16].

There was a significantly low average CD4 count among the infected persons, with the lowest CD4 counts observed in subjects with HIV/TB coinfection. This is in agreement with the findings of Asrat [10] and Anglewicz [16], which concluded that immune status (especially CD4 counts) declines significantly especially in the event of a comorbidity such as TB [18, 19].

Subjects with significantly low CD4 cell counts qualify as late presenters and contribute to almost 50% of the study population. Late entry into treatment in people living with HIV have been previously attributed to the use of alternative medicine and late entry into treatment [18 -20].

WBC was significantly higher in TB infected individuals compared to control subjects. this agrees with the findings of related studies reporting significantly elevated WBC in patients with pulmonary tuberculosis (PTB) [21-23]. Tuberculosis is chronic and impacts the haemopietic system. Elevated WBC count also confirms the presence of a chronic and persisting infection especially in TB-infected individuals [22].

RBC and PCV decreased significantly in all infected subjects, this is consistent with the findings of previous studies which reported a significant decline of RBC in HIV and TB infected persons [18, 19, 22]. These infections are chronic and could lead to a decrease in erythropoiesis [20].

The ESR values were observed to be significantly higher in HIV/MTB infected persons (111.1±42.1mm/hr), followed by TB (91.1±42.7mm/hr) and HIV (71.5±45.2mm/hr) infected persons in comparison to control subjects. This agrees with other studies [21, 22]. ESR is most usually raised in the presence of persistent infectious agents. This increase have been attributed to the increased proliferation of acute phase proteins usually observed in chronic infections, especially in TB infection [23].

5. CONCLUSION

Independent ad conjoint HIV and TB infections are prevalent among chronically ill adult subjects referred to tertiary health centers in Port Harcourt, Rivers State, Nigeria. The occurrence of these infections was observed mostly among the young population. There is a need for intensive and improved public health enlightenment to improve voluntary testing and early entry into treatment especially among the young population. Urgent implementation of public health education and testing of at-risk populations, early disease detection and early commencement of treatment of infected subjects should prove effective in the control of the scourge and mitigate its occurrence in the region.

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