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Assessment of the Prevalence and Risk Factors of HBV AND HIV CO- Infections among HIV Infected Patients Attending ART Clinic in Port Harcourt

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Authors' contributions

The work was carried out in collaboration between authors. Author POI designed the study and managed the literature search. Author OEA wrote the first draft while author KTW managed the analyses of the study. Author AJI performed statistical analysis. All authors read and approved the final manuscript.

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ABSTRACT

Background: HBV and HIV infection are both high prevalence infections in our society and often associated with chronic diseases, high morbidity and mortality. Both viruses share similar characteristics such as same route of transmission, the use of reverse transcriptase enzyme for replication, tendency to develop chronic infections, and an immense capacity of mutation in their genome.
Aims: To determine the prevalence and the associated risk factors of HBV among HIV positive patients in Port Harcourt, using ELISA kits and questionnaires.
Methodology: This cross sectional study of HBV/HIV co-infection was carried out among 100 HIV positive attending adult ART-clinics in UPTH between July and August 2017 using HBsAg ELISA kits(DIA.PRO, diagnostic Bioprobes Srl. Italy.) and questionnaires for the evaluation of possible independent predictors and other variables such as social demographic characteristics.
Results: Overall prevalence of HBV/HIV co infections in the study was 22%, with demonstrable

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decreased prevalence of HBV/HIV co infections with increasing age of respondents but this relationship was not statistically significant P<0.05. Similarly, the relationship between HBV/HIV co infection and level of CD4+ counts was also not statistically significant P<0.05 While unlike primary and secondary level education, there was statistically significant relationship between HBV/HIV co infections and tertiary level of education P<0.05.,

Conclusion: The high prevalence of HBV/HIV co infections our study corroborated the report of high burden of this disease in Nigeria. To reverse the steady state of this "hyper-endemicity,'' there is need for coordinated health education, as well as strict adherence to management guidelines to minimize possible associated complications

Keywords: HBV; HIV; co-infection; prevalence; Port Harcourt.

1. INTRODUCTION

Hepatitis B virus (HBV) causes the most severe infections among the of hepatitis viruses. Is a notable public health problem worldwide,with as much as 400 million cases of chronic infections and an estimated 6 million co-infection with human immunodeficiency virus (HIV) [1].

Hepatitis B virus (HBV) and HIV are both high virulent as well as high prevalence organisms worldwide. They are associated with high rate of morbidity and mortality and more worrisome is the fact that, none of the currently available therapy can completely eradicate them rather they are aimed at viral suppression to enable good quality of life [2]. Globally, HBV is reported to be the major cause of chronic liver disease and a leading cause of death. It is said to be responsible for about half of all cases of cirrhosis and hepatocellular carcinoma [3]. HIV and HBV co infections are common due to their shared transmission routes, worldwide and regional edemicity [4]. Other similar characteristics between these viruses includes the use of reverse transcriptase enzyme for replication, tendency to develop chronic infections, and the immense capacity for mutation in their genomes. This characteristics enable the virus to develop mutant strains, some of which are resistant to the commonly used anti-viral agents [5]. Despites the shared characteristics between these viruses, is been noted that HBV is about 100 times more infectious than HIV. This assertion was supported by epidemiological studies report that more than two thirds of all HIV-infected individuals possess markers suggestive of present or previous HBV infection and never the reverse [6]. Some predisposing factors noted to be commonly associated with this co infections includes men having sex with men (MSM), injecting drug users (IDUs) and unprotected multiple sexual activities among heterosexuals [6].

Although, the specific mechanisms by which HIV interacts with HBV to influence disease progression are not clearly understood but the occurrence of the dual viruses in patients are usually associated with increased risk and severity of liver cirrhosis. Is also associated with more rapid progression to end-stage liver diseases and increased in severity of other liver pathologies among HIV positive individuals especially those with increased HBV replications [7].

In addition, HIV patient co infected with HBV especially those with low CD4+ counts are commonly associated with more severe complication of both infections [8]. Although the pathway for this complication is not also clearly understood however, HIV has been reported as an agent that facilitates increased replication of HBV and reactivation of previous infection [8]. And also noted is the decreasing rate of spontaneous resolution of new infection associated with HIV [8]. The severity of this dual infection has been closely associated with the level of CD4+ count [9]. The overall worldwide rates of HIV/ HBV co-infections ranges between 5% – 30%, depending on geographic location [9]. In an independent cohorts studies done in Europe and North America, the prevalence of HBV-HIV co infection were 8.7% and 7.6% respectively [1]. While South African wide studies among different social demographic strata, varied prevalences of HBsAg were reported among patient attending ARV clinics as follows 19.8% in industrial ART cohort,22.9% in peri-urban area and 7.1%in rural area ART clinic population [1,10]. In Nigeria, a prevalence of 17% was found among attendees of adult HIV clinics and 10% among pregnant attending PMTCT clinic while 12% and 10% were reported respectively among HIV-infected children and newly discovered HIV-infected voluntary blood donors5. Generally, the overall prevalence of HBV and HIV co infections in Nigeria had been

estimated to be 15% [5] this indeed represent a great national burden which requires further research with a view of reviewing our treatment guidelines, identification of other risky behaviors predisposing HIV positive individual to this highly infectious virus and other appropriate policies. This study aimed at estimating the burden and prevalence of HBV and HIV co infections among patients attending adult ART clinic in Port Harcourt.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in the university of port Harcourt teaching hospital, Port Harcourt rivers state, The hospital is located in the oil rich Niger delta of Nigeria and tend to serve the large population of people living in the south-south geographical zone.

2.2 Study Population

This cross sectional study was carried out among HIV positive adults patients attending ART clinic at the University of Port Harcourt Teaching Hospital between July and August 2017. The sample size required for the study was 100 including attrition rate of 5% (given a prevalence of 6.7% from previous study [11]) and based on sample size calculation formulae N = z2pq/d2 (where z = Standard normal deviation at 1.96 (corresponding to 95% confidence interval; p = Prevalence of Hepatitis B surface antigen among HIV positive adults in Port Harcourt from previous studies; q = 1-p; and d = degree of accuracy/ precision expected = 0.05) [12].

Blood samples were collected from ninety six of the one hundred respondents.

2.3 Ethical Clearance

Ethical clearance for this study was obtained from UPTH Ethical review Committee.

2.4 Statistical Analysis

Data obtained from this study was analyzed using the statistical package for social sciences (SPSS) version 20. The level of significance set at 0.05. Chi square test was used to estimate the possible association between HBV/HIV co infections (dependent variable) and age, gender and, level of education and the immunologic characteristics (independents variables).

2.5 Method of Sample Collection

5ml of blood samples were collected aseptically into EDTA, Plasma was separated by a low speed centrifugation at 1500 rpm for 5 min aliquots was made in into sterile eppendorf tubes for subsequent use, and stored frozen at -20°C until tested. The plasma was used to test the serology of Hepatitis B virus surface antigen (HBsAg) using enzyme linked immunosorbent assay kit (DIA.PRO, diagnostic Bioprobes Srl. Italy.)

2.6 EISA Method

2.6.1 Preparation of components

The components of the kit were prepared according to the manufacturer directions.

2.7 Method of Analysis

The numbers of required strips were placed on the plastic holder and were washed once to hydrate the wells. The wells for controls, caliberator and samples were carefully indentified. The A1 well was left empty for blanking purposes.

Using the pipette, 150 µl of the negative control was triplicated, 150 µl of the calibrator duplicated and 150 µl of the positive control in single followed by 150 µl of each of the samples. The presence of the samples in the well was checked by unaided eyes for a marked colour difference between empty and full wells.

About 100 ml of enzymatic conjugate was dispensed in all wells, except A1 used for blanking operations. Proper care was taken not to touch the inner surface of the well with pipette when the conjugate was dispensed, to prevent contamination.

Colour from yellow to pink/red was observed and then the micro plates with strip sealed were incubated for 120 minutes at 37°C.

After incubation the micro wells were washed according to the manufacturer directives, then 200 µl chromogen/substrate was transferred into all the wells including A1 using pipette. The micro plate was again incubated at room temperature away from direct sun light for 30 mins. 100 µl of sulphuric acid was subsequently was added into all wells to stop the enzymatic reaction using same pipetting

sequence. Finally the colour intensity of the solution in each well was measured using a 450 nm filter, a 620-630 nm filter and blanking instrument on A1.

3. RESULTS

Of the 100 respondents recruited for the study, four (4) declined consent for sample collection while samples were collected from 96 respondents and of this, 21 were positive for HBV representing 22%.

With respect to age of respondents, those between age range 20-30 years had the highest rate of co infections which accounted for 42.9% and closely followed by 33.3% among of age range 31-49years while those >50years had the least rate of 9.5%.

With respect to marital status, the married respondents though lower in number but had a higher of HBV/HIV co infections 57.1% but it was not statistically significant P<0.05. The relationship of gender with HBV/HIV co-infection shows 57.1% of women and 42.9% which also was not statistically significant P<0.05. On the level of education of respondents, those with only primary level of education had the highest HBV/HIV co infections rate but it was however not statistically significant P< 0.05. While those with tertiary level of educational relatively had the lowest rate of the co infection and was statistically significant P<0.05 Table 1.

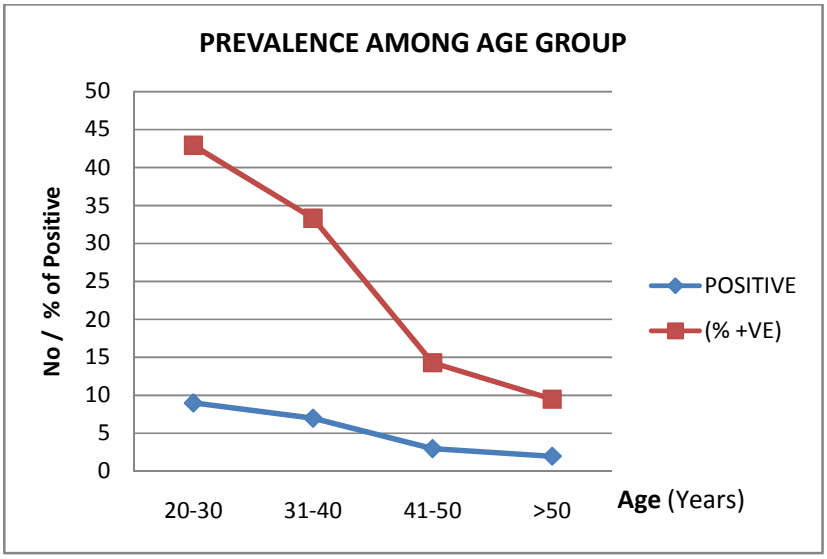

Fig. 1. Prevalence among age group

Table 1. Prevalence of HBV and HIV co infections among HIV infected patients attending ART clinic in UPTH, Nigeria in relation to socio demographic Characteristics

	Total	HBV/HIV +VE	HBV/HIV -VE	(% +VE)	Chi-Square (p-value)
Gender					0.72 (0.3956)**
Male	47	12	35	57.1	
Female	49	9	40	42.9	
Marital status					1.01 (0.3135)**
Single	51	9	42	42.9	
Married	45	12	34	57.1	
Level of education					
Primary	23	11	12	52.4	1.10 (0.2941)**
Secondry	28	5	23	23.8	0.37 (0.5411)**
Tertiary	45	5	40	23.8	5.74 (0.0165)*

**Difference is statistically significant, **Difference is not statistically significant*

Table 2. Prevalence of HBV and HIV co infections among HIV infected patients attending ART clinic in UPTH, Nigeria in relation to Durations on ART

Duration on ART(yrs)	Total respondents	Number positive	% positive
<1	24	6	28.6
1-5	54	11	52.4
>5	18	4	19.0
Number examined	96	21	100.0

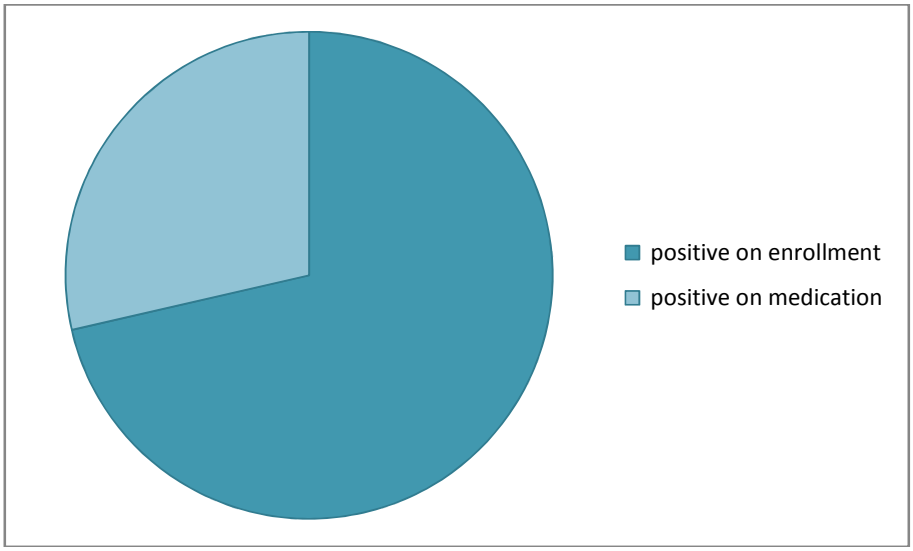

Fig. 2. Time of detection of hbv among HIV patients attending ART clinic in UPTH, Nigeria

Table 3. Immunological characteristics of patients co infected with HBV and HIV attending ART clinic in UPTH, Nigeria

CD4 at enrollment	Positive cases at enrollment	Positive study	% Positive	
<100	6(40.00)	2 (33.30)	38.1	0.08 (0.7762)**
100-200	4 (26.70)	1 (16.70)	23.8	0.23 (0.6269)**
201-500	2 (13.30)	2 (33.30)	19.05	1.11 (0.2916)**
500 and Above	3 (20.00)	1 (16.70)	19.05	0.03 (0.8605)**
Number examined	15 (100.0)	6 (100.0)	100.0	

Analysis of duration on ART among respondents shows that 52.4% of those who had been on ART between 1-5years are positive for HBV/HIV co infections while those greater than 5years and less than one year on ART had positive rate of 19% and 28.6% respectively.

As much as 71.4% co-infected respondents was detected at enrolment into ART while only 28.6% of the total HBV/HIV co infection were first detected at study.

The relationship of CD4 count level and rate of co-infections showed the highest percentage in those with CD4 count less than 100 cell/mm [3] but was however not statistically significant P<0.05.

4. DISCUSSION

The advent of combination ART has revolutionalised the field of HIV medicine with evidences of improved quality of life and reduction in morbidity and mortality among patients [13]. However, HIV co-infections with other pathogens such as hepatitis B virus (HBV) had in no little way jeopardized this gain with attendant increased in co morbidities among HIV positive groups. These two viruses share similar modes of transmission, making those at

risk of one to be at risk of the other. (WHO, 2016) [13].

In Nigeria, the overall HBV and HIV co infections prevalence was estimated to be 15% [5], it's also been shown that between 10-70% of all HIV positive individual had HBV in Nigeria [14]. This clearly demonstrated a high burden of these diseases in our country. In our study, HBV/HIV co infections overall prevalence was 22%, this was close to the prevalence of 25.9% reported in Jos, Nigeria [15]. Our finding was however lower than the findings of Iwolekun et al. who reported 51.9% among HIV positive patients in Lagos [16] And that of Nwokedi et al. with a much higher prevalence of 70.5% among HIV positive patients in Kano, Nigeria [17]. Other similar studies in Nigeria and parts of the world, reported lower prevalences such as 9.7% and 6.7% by Ejele et al*. and* Okon et al in Nigeria while 16%, [18] 12.5% and 12.6% by Djuidje et al, Zoufaly et al. [19] and Laop*.*

Urent et al. [20]. The variations in prevalence obtained from different studies may be due to methodology and other factors such as host factors, behavioral and environmental factors [14] With regard to gender, our findings showed that the prevalence of HIV/HBV co-infection is higher in females with a prevalence of 57.1% than in males 42.9%. This was similar to the report of Okechuchwu et al. with prevalences of 65.5% and 34.4% among females and males respondents respectively [21]. Higher prevalence of HIV/HBV co infection was found among those who were married as opposed to the singles with prevalence of 42.9% which could be probably age related and the possibility that the married respondents may have had more exposures than the singles.

With regard to level of education, there was no statistically significant association between primary and secondary levels of education and HBV prevalence in our study $P<0.05$,similar findings was reported by Eke et al. [22] However, the relationship between HBV/HIV co-infection and tertiary level of education was statistically significant $P<0.05$. Ezegbudo et al. found same positive association in a similar study among HIV positive pregnant women [23]. Although, age is a strong variable in the determination of host susceptibility to infection but generally, it has not been so documented as a notable predisposing factor for this co infections and similar finding was shown in our study. Age group 20-30years had the highest prevalence of 42.9% and with demonstrable decrease in rate of HBV/HIV co infection with increase in age of respondents. This could be as a result of the several routes of acquisition of these infections possible in the younger age group and possibility of age related clearance of the infection or death leaving between 5-10% as chronic carriers in older age groups [14]. With respect to immune status, it was observed in our study that HBV/HIV co infection increased with decrease CD4+ counts, although, this was not statistically significant. Similar findings were reported by Lar et al. [24] and Hoffman et al. Hoffman et al. further reiterated his fact with this assertion "HBV does have any direct effect on CD4+ count as do HIV which directly affects and destroys the CD4+ cells", this invariably means that any association noted between CD4+ counts and HBV/HIV co-infection may likely be due to the HIV mono infection [25].

5. CONCLUSION

The burden of HIV_HBV co infection in Nigeria as adjudged by the overall prevalence of 15% and a prevalence of 22% from our study. This has indeed resulted to worsening health indices among HIV positive individuals as reflected by high morbidity and mortality associated with this group despite adequate drug compliant.

6. RECOMMENDATIONS

Our study findings shows that as much as 71.4% of the respondents were infected with HBV before enrollment for HIV treatment which could likely be explained by the shared route of transmission of both infections which most people might not be aware of. As a result, same intensity of awareness used for health educating the masses with regard to HIV preventions should also be directed towards HBV prevention. Training of health care providers on new ART guidelines that incorporates HBV management and the possibility of HBV vaccination targeted at HIV positive individuals should be considered by policy maker.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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