PREVALENCE AND CO-INFECTION OF *HELICOBACTER PYLORI* AND HEPATITIS C VIRUS AMONG HIV PATIENTS ON ART IN PORT HARCOURT, NIGERIA

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Abstract:

Helicobacter pylori **is one of the most common and medically prominent infections worldwide and has been implicated in various gastric disorders including peptic ulcer disease (PUD). Several investigators have reported a high prevalence of** *H. pylori* **infection in patients with chronic liver diseases. Some have suggested that it might contribute to the mechanism of hepatitis C (HCV) related hepatocellular carcinoma (HCC). The relationship between** *H. pylori* **and chronic hepatitis C (CHC) remains controversial. This cross-sectional study aimed to investigate the seroprevalence of** *H. pylori* **co-infection with Hepatitis C among HIV-positive patients receiving antiretroviral therapy (ART) and its correlation with viral load at the Rivers State University Teaching Hospital (RSUTH), Nigeria. A total of two hundred (200) participants were recruited and screened for** *Helicobacter pylori* **and HCV antibodies using rapid diagnostic tests (RDTs) while HIV viral load was performed using Reverse Transcription-polymerase chain reaction (RT-PCR), Questionnaires were used to obtain demographic data of the participant. The results revealed a 60.5% prevalence of** *H. pylori***, with none testing positive for antibodies to HCV (Anti-HCV). The majority of the participants were within the age range of 33-40 years, predominantly females 69.0%, married 46.0%, secondary education 54.0%, and participants with viral load less than 20 copies/ml 74.0%. Across all viral load ranges, the prevalence of the specific outcome appears to be relatively consistent, ranging from 60.1% to 63.3%. There was no statistical association between the demographic variable and the infection (p > 0.05). In conclusion, while the prevalence of** *H. pylori* **is high with no HCV infections among HIV-infected individuals in Port Harcourt, the specific outcome or characteristic of viral load is somewhat consistent indicating, despite the difference in counts, the prevalence within each range is quite similar.**

Keywords: *Helicobacter pylori*, Hepatitis C, Viral load, ART, prevalence

1. Introduction

HELICOBACTER *pylori* infection affects an estimated 50% of the global population, marking it as a significant pathogen of concern. This concern is heightened by its classification as a Group I carcinogen by the World Health Organization (WHO) [1, 2]. *H. pylori* is a Gram-negative, helical, microaerophilic bacterium that colonizes the stomach [1]. It is associated with various gastric conditions, such as peptic ulcer disease (PUD), gastritis, gastric mucosa-associated lymphoid tissue (MALT) lymphoma, and gastric adenocarcinoma [3].

Several studies have explored the prevalence of *H. pylori* infection across Nigeria, highlighting differences based on demographics, age, occupation, gender, marital status, education level, and health conditions. The Northern region has been identified as having the highest prevalence of *H. pylori*. Various risk factors, such as low socioeconomic status, poor personal and environmental hygiene, lack of access to treated water, overcrowded living conditions, alcohol consumption, smoking, and limited knowledge of *H. pylori*, have been associated with its spread in Nigeria. Addressing poverty could significantly aid in controlling the infection [4]

Globally, more than 350 million people are chronically infected with hepatitis B virus (HBV) and 170 million with hepatitis C virus (HCV) [5, 6]. In Africa, around 100 million individuals are affected by HBV or HCV [6, 7]. These infections are responsible for 80% of liver cirrhosis and hepatocellular carcinoma (HCC) cases in Africa, with HBV being the leading cause of end-stage liver disease [6, 7].

HCV was first identified in 1989, and to date, around 180 million people have been infected worldwide. If not managed properly, chronic hepatitis C (CHC) can lead to cirrhosis and, eventually, hepatocellular carcinoma (HCC) [8]. HCV is a major cause of chronic hepatitis, cirrhosis, liver disease, and HCC globally [9,10, 11] and is a leading reason for liver transplants [12]. There are currently over 71 million HCV-infected people worldwide, with complications from end-stage liver disease due to HCV contributing to 400,000 deaths annually [13]. Emerging evidence suggests that *H. pylori* may be a risk factor for cirrhosis and HCC in patients with CHC, though some researchers argue that it does not play a role in HCV-related HCC. The relationship between *H. pylori* and CHC remains controversial [8].

This study aims to investigate the prevalence and coinfection of *H. pylori* and HCV co-infection among HIV-infected individuals on antiretroviral therapy (ART) in Port Harcourt, Nigeria.

2. MATERIALS AND METHOD
2.1 Study Area

This study is to examine the prevalence and co-infection of *Helicobacter pylori* and Hepatitis C among HIV-infected individuals visiting the HIV clinic of the Rivers State University Teaching Hospital (RSUTH). It is a government-owned hospital and was initially a General Hospital and later upgraded to serve as a University Teaching Hospital for the College of Medical Services of the Rivers State University

2.2 Study Design

A hospital-based cross-sectional study design was adopted for the present study. The method for this study consists of informed consent and blood withdrawal by venipuncture. A well-structured questionnaire was administered to the participant to obtain their socio-demographic data (age, sex, marital status and educational background

2.3 Sample collection

The method of sample collection employed was the vein puncture technique. A soft tourniquet was fastened to the upper hand of the patient. The punctured site was cleansed with methylated spirit, and the vein was punctured with a 3 ml syringe. After sufficient blood collection, the tourniquet is released, and the needle is removed immediately. About 3 ml of venipuncture blood was collected in EDTA BA Vacutainer TM anti-coagulant tubes, labelled with each patient's details. Plasma specimens were separated by centrifugation at 3,000 rpm (revolution per minute) for 5 min.

2.4 Serological analysis

The plasma was examined for HBsAg at the Virus & Genomics Research Unit, Department of Microbiology, University of Port Harcourt, Nigeria. Using HBsAg test strips, plasma taken from the participant's blood was examined for the presence of HBsAg. To find HBsAg in the blood, the strips were applied step-by-step. The test followed the manufacturer's instructions, and the findings were interpreted accordingly. viral load analysis was done using Abbott Real-Time Polymerase Chain Reaction

2.5 Data analysis

Data obtained from the study were subjected to statistical analysis using Excel and SPSS. Statistical significance for all analyses was determined at a 5% significance level.

2.6 Ethical consideration

The study was conducted after obtaining ethical clearance from Rivers State University Teaching Hospital Health Research Ethics Committee.

3. RESULTS
3.1 Study Population Characteristics

A total of 200 confirmed HIV patients attending the HIV Clinic of Rivers State University Teaching Hospital, Port Harcourt, Rivers State participated in the study. Out of the total number of individuals tested, 6.0% were below 18 years old, 15% were aged 18-32, 51.5% were aged 33-48, and 27.5% were above 49 years old. In terms of gender, 31.0% were male and 69.0% were female. Regarding marital status, 35.5% were single, 46% were married, and participant separated were 18.5%. For educational status, 7.5% were illiterate, 11.5% had primary education, 54% had secondary education, and 27% had tertiary education. Finally, for viral load, 74% had a plasma viral load (PVL) of less than 20 copies/ml, 20.5% had a viral load between 20-999 copies/ml, and 5.5% had a viral load above 1000 copies/ml. Characteristics of the study group are highlighted in Table 1.

TABLE 1
PATIENTS CHARACTERISTICS

VARIABLES	NO TESTED	PERCENTAGE (%)
AGE GROUP		
≤ 17	12	6.0
18-32	30	15
33-48	103	51.5
≥ 49	55	27.5
GENDER		
Male	62	31
Female	138	69
MARITAL STATUS		
Single	71	35.5
Married	92	46
Separated	37	18.5
EDUCATIONAL STATUS		
Illiterate	15	7.5
Primary	23	11.5
Secondary	108	54
Tertiary	54	27
VIRAL LOAD		
Less than 20	148	74
20-999	41	20.5
More than 1000	11	5.5
TOTAL	**200**	**100.0**

3.2 Overall Prevalence of HCV, and *H. pylori* among the participants

Of the 200 HIV-infected participants tested for *Helicobacter pylori*, HCV, and plasma viral load at Rivers State University Teaching Hospital (RSUTH), Rivers State, Nigeria, 60.5% were positive for *H. pylori* and none (0.0%) for HCV antibody.

3.3 Prevalence of *H. pylori* among the participants based on their sociodemographic characteristics.

3.3.1 *The Prevalence of H. pylori by Age Group*

The data illustrates the prevalence of *Helicobacter pylori (H. pylori)* across different age groups in a tested population. For the group below 18 years old, out of 12 individuals tested, 66.7% were positive for *H. pylori*. In the 18-32 age group, out of 30 individuals tested, 60.0% were positive. For those aged 33-48, 103 individuals were tested, with 60.2% testing positive for *H. pylori*. Lastly, in the 49 years and above age group, out of 55 individuals tested, 60.0% were positive for the infection (Figure 1).
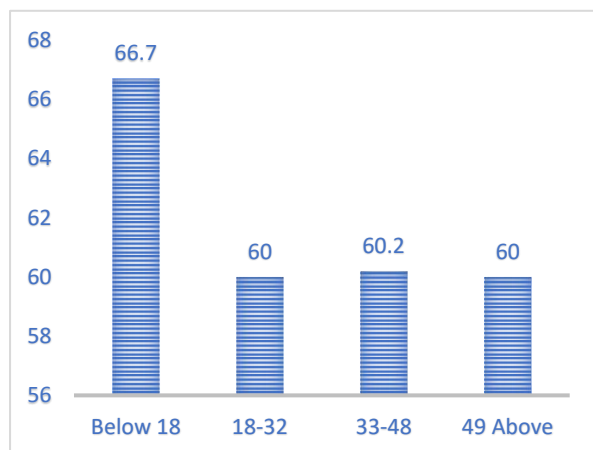

Figure 1: The Prevalence of *H. pylori* by Age Group

3.3.2 *The Prevalence of H. pylori by gender*

The data presents the prevalence of *Helicobacter pylori (H. pylori)* among males and females within the tested population. Out of 62 males tested, 38 (61.3%) were positive for H. pylori. In comparison, among the 138 females tested, 83 (60.2%) were positive for *H. pylori*. The p-value for the difference in *H. pylori* prevalence between males and females is 0.878, indicating that there is no statistically significant difference in *H. pylori* prevalence between the genders in this population (Figure 2).
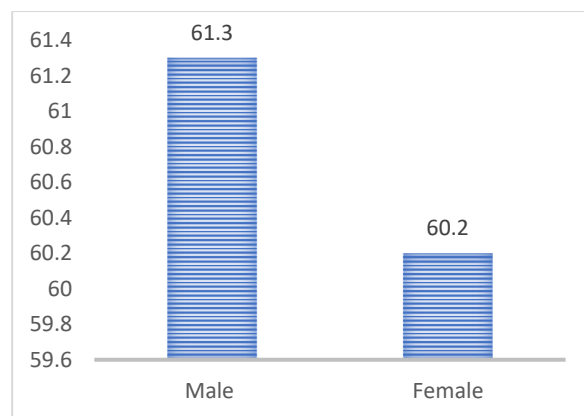
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Figure 2: The Prevalence of *H. pylori* by gender

3.3.3 *The Prevalence of H. pylori by marital status*

The data presents the prevalence of *Helicobacter pylori (H. pylori)* among individuals with different marital status. Among 71 single individuals tested, 46 (64.8%) were positive for *H. pylori*. In the group of 92 married individuals, 51 (55.4%) tested positive for *H. pylori*. Among the 3 divorced/separated/widowed individuals tested, 70.6% were positive for *H. pylori*. The prevalence rates vary by marital status, with the highest prevalence observed in the separated group (Figure 3).
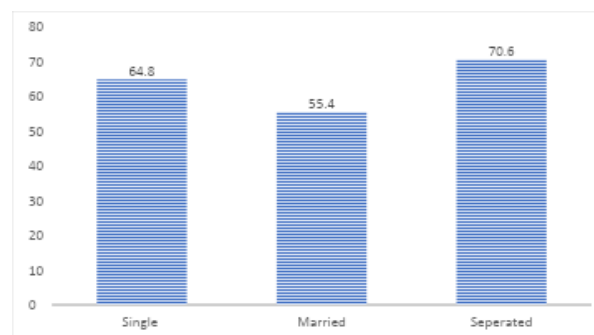

Figure 3: The Prevalence of *H. pylori* by Marital Status

3.3.4 *The Prevalence of H. pylori by educational status*

The data presents the prevalence of *Helicobacter pylori (H. pylori)* among individuals with different levels of educational attainment. Among 15 illiterate individuals tested, 11 (73.3%) were positive for *H. pylori*. In the primary education group, which included 23 individuals, 11 (73.3%) tested positive. Among 108 individuals with secondary education, 65 (60.2%) were positive for *H. pylori*. In the tertiary education group of 53 individuals, 33 (60.3%) tested positive. Lastly, in the "Others" category, which included 1 individual, 100% tested positive for *H. pylori*. The p-value for *H. pylori* prevalence across different educational

levels is 0.508, indicating that there is no statistically significant difference in *H. pylori* prevalence related to educational status in this population (Figure 4).
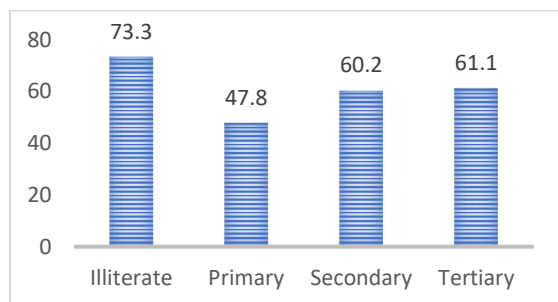

Figure 4: The Prevalence of *H. pylori* by educational status

3.3.5 The Prevalence of H. pylori in relation to plasma viral load

The data presents the prevalence of *Helicobacter pylori (H. pylori)* among individuals with different viral load levels. Among 148 individuals with a viral load of less than 20, 89 (60.1%) were positive for *H. pylori*. In the group with a viral load between 20 and 999, which included 41 individuals, 25 (61.0%) tested positive. Among the 11 individuals with a viral load of more than 1000, 7 (63.3%) tested positive for *H. pylori*. The p-value for *H. pylori* prevalence across different viral load levels is 0.972, indicating that there is no statistically significant difference in *H. pylori* prevalence based on viral load in this population (Figure 5).
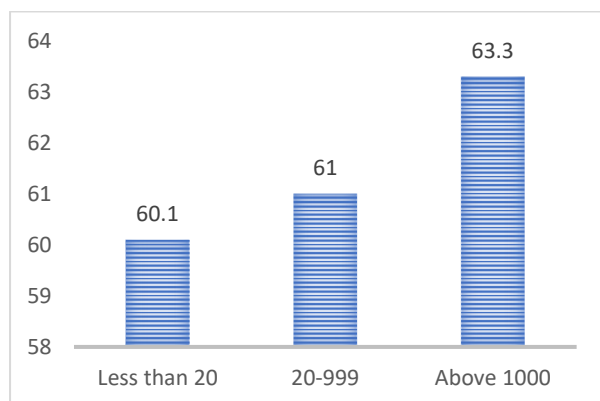

Figure 5: The Prevalence of *H. pylori* in relation to plasma viral load

4. DISCUSSION

While *Helicobacter pylori* or related Helicobacter species have been detected in liver samples from patients with various liver conditions, and research is increasingly exploring the potential role of *H. pylori* in liver disease development, few studies have demonstrated a direct link between *H. pylori* and the pathogenesis of liver diseases [14]. Hepatitis C virus (HCV) is a major cause of chronic liver conditions, including hepatitis, cirrhosis, liver disease, and hepatocellular carcinoma (HCC)

globally [9, 10, 11]. Chronic hepatitis C is a slow but progressive disease that can develop into cirrhosis and HCC over several decades [15, 16].

4.1 Prevalence of H. pylori infection by socio-demographic characteristics

In the present study, the highest prevalence of *H. pylori* infection was found in individuals under 18, with a rate of 66.7%. This finding aligns with previous studies that also reported a higher prevalence among younger age groups, such as children under 10 in the Bakassi Peninsula and Etim Ekpo in South-Southern Nigeria [17], and those aged 12-17 in Port Harcourt, Nigeria [18]. Another study reported a high prevalence in individuals under 15 in Lafia, Nigeria [19]. However, these results differ from other studies that observed higher prevalence rates in the 20-40 age group in Port Harcourt [20] and in the 26-30 age range [21, 22]. Additional studies noted a greater prevalence among pregnant women aged 20-29 in Port Harcourt [23]. Furthermore, some research found the highest prevalence among individuals aged 40-60 in Owerri, Imo State [24, 25, 26, 27] and Calabar, Nigeria [28], as well as among those aged 40-50 in Port Harcourt [29, 30], and in individuals over 50 in Yilmana Densa District, Northwest Ethiopia [31]. These differences may be attributed to variations in the population studied and diagnostic methods used in each study.

Regarding marital status, this study found a higher prevalence (77.8%) of *H. pylori* among separated individuals, which contrasts with the findings of [24], who reported a higher prevalence among singles. Additionally, [26] and [22] noted a higher prevalence among married individuals in Port Harcourt and Calabar, Nigeria. [31] observed similar trends in married groups in Yilmana Densa District, Ethiopia, and [19] reported the highest rates of married individuals in Lafia, Nigeria.

A 73.3% prevalence of *H. pylori* was found among illiterate individuals, aligning with [5], who also reported the highest prevalence among this group. This finding is consistent with [27] in Owerri, Nigeria, and [31] in Yilmana Densa District, Ethiopia, which both observed the highest rates among illiterate individuals. [19] Similarly noted a higher prevalence among those with informal education.

Lastly, the HIV RNA viral load in this study was not significantly associated with *H. pylori* seropositivity (P=0.972), consistent with the findings of [32], who also reported no significant association between viral load and *H. pylori* infection.

5. CONCLUSION

The majority of the participants were within the age range of 33-48 years, predominantly females, married, secondary education, and with

viral load less than 20 copies/ml 74%. This study's findings demonstrated that the population is free of HCV. However, a high proportion of the participants had *H. pylori*, indicating endemicity in the study area. There was no co-infection between *H, pylori* and Hepatitis C. The current study's findings serve as a baseline for further research into *H. pylori* infection in the South-South region of Nigeria. Across all viral load ranges, the prevalence of the specific outcome appears to be relatively consistent indicating despite the difference in counts, the prevalence within each range is quite similar.

Acknowledgement

Disclosure of conflict of interest

The authors claim that there are no conflicting interests.

Statement of ethical approval

All authors declare that all experiments have been examined and approved by the Rivers State University Teaching Hospital Health Research Ethics Committee. Therefore, the study is performed following the ethical standards

Statement of informed consent

All authors declare that informed consent was obtained from all individual participants included in the study.

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