

## HELICOBACTER PYLORI AND TREPONEMA PALLIDUM (SYPHILIS) CO-INFECTION AMONG HIV PATIENTS ATTENDING A PRIVATE CLINIC IN WARRI, DELTA STATE, NIGERIA.

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Received: 12-05-2024

Accepted: 01-08-2024

<https://dx.doi.org/10.4314/sa.v23i3.35>

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Journal Homepage: <http://www.scientia-african.uniportjournal.info>

Publisher: *Faculty of Science, University of Port Harcourt.*

### ABSTRACT

*This delve examined the periodicity of polyinfection of Helicobacter pylori and Treponema pallidum in HIV-infected individuals who visited Capitol Hills Clinic in Warri, Delta State, Nigeria. Syphilis and H. pylori infections are major worldwide health issues that have diverse clinical presentations and consequences. It is essential to comprehend the co-infestation rates of syphilis and H. pylori in HIV patients to effectively manage patient care, given the resurgence of syphilis and the ongoing incidence of H. pylori. A study employing a cross-sectional design was carried out, which included a hundred individuals living with HIV who were receiving medical treatment at Capitol Hills Clinic. Blood samples were obtained and examined using fast diagnostic test kits to spot the existence of H. pylori and Treponema pallidum. The study involved the analysis of demographic characteristics, such as occupation, age, marital status, religion, and sex, to discover how these components are related to the prevalence of co-infestation. Results from the study showed that 67% of HIV-infected patients had a significant co-infection incidence of H. pylori, but no cases of Treponema pallidum were observed. The incidence of H. pylori differed among various age groups, with the greatest incidence seen among those aged 21-40 years (71%). Gender-wise, males showed a somewhat greater prevalence (69%) compared to females (65%). Marital status seems to have an impact on the prevalence, as married persons exhibited a greater prevalence rate of 71% compared to singles, who had a prevalence rate of 64%. The findings underscore the significance of frequent screening for H. pylori and syphilis co-illnesses among HIV patients, especially in places with a high burden of both infections like Nigeria. These co-infections might complicate the clinical management of HIV, potentially leading to increased morbidity and mortality.*

**Keywords:** *Helicobacter pylori*, HIV, Nigeria, Patients, Syphilis, *Treponema pallidum*, Warri

## INTRODUCTION

Syphilis, a lifelong generalized infectious condition, is brought on by the spirochaete bacterium *Treponema pallidum*. The specific subspecies of *Treponema pallidum* responsible for venereal and congenital syphilis only affects humans [1]. It is characterized by unique mucocutaneous lesions and may involve internal organs, presenting with or without systemic symptoms. Due to its varied clinical manifestations, which frequently resemble other conditions, syphilis has been dubbed "the great imitator" (Forrestel et al., 2020; Tudor et al., 2021). Initially identified in the late 15th century, syphilis precipitated significant epidemics during the European Renaissance and later spread globally (McGough&Erbelding, 2006; Arora et al., 2016; Beale et al., 2019). Although its incidence waned in the latter half of the twentieth century, sexually acquired syphilis has experienced a marked resurgence since 2000 in developed nations (Forrestel et al., 2020; Ghanem et al., 2020).

On the other hand, *Helicobacter pylori* (*H. pylori*) is the most prevalent bacterial contagion globally (Logan & Walker, 2001), afflicting nearly half of the global populace. Establishing infection necessitates several factors encompassing environmental, bacterial, and host elements (Yamaoka, 2010). However, a large proportion of infected individuals fail to clear the infection, leading to chronic gastritis, which may progress to gastric ulcer, gastric adenocarcinoma, or mucosa-associated lymphoid tissue (MALT) lymphoma (Shepherd et al., 2016). Notably, the prevalence of *H. pylori* infection displays temporal and geographical disparities, with industrialized nations reporting lower rates compared to their developing and underdeveloped counterparts, particularly among children.

Human immunodeficiency virus (HIV), initially discovered as the causal culprit of acquired immunodeficiency syndrome (AIDS) in 1985, primarily compromises cell-mediated

immunity, leaving infected individuals highly vulnerable to opportunistic infections and tumors (Cookey et al., 2023). Notably, HIV-related opportunistic infections typically include Candida infections and opportunistic tumors. Interestingly, *Helicobacter pylori* (*H. pylori*) cannot be classified within the spectrum of HIV-related opportunistic illnesses. Rather, it can show up within the initial stages of HIV infection when immune function is largely intact (Nevin et al., 2014).

Against this backdrop, the study aimed to determine the prevalence of co-infection with syphilis and *H. pylori* among HIV patients at Capitol Hills Clinic in Warri, Delta State, Nigeria. This investigation underscores the complex interplay between HIV infection and other pathogens, highlighting the importance of understanding concurrent infections in managing HIV/AIDS patients.

## MATERIALS & METHOD

### Study Area

The delve study was undertaken at Capitol Hills Clinic, situated in Warri, Delta State, Nigeria which serves as a vital healthcare hub within the region. Warri is a significant urban centre located in the southern part of Nigeria, known for its commercial activities, oil industry presence, and cultural diversity. The healthcare landscape in Warri, including Capitol Hills Clinic, is likely influenced by the socio-political dynamics of the region, as well as broader national healthcare policies and initiatives.

### Study Design

This probe adopts a cross-sectional approach involving patients receiving medical care at Capitol Hills Clinic Warri, Delta State, Nigeria.

### Study Population

The focal group comprised all individuals diagnosed with HIV receiving medical treatment at the hospital. A total of 100 samples were gathered and incorporated into the study.

### Sample Collection, Transport, Preparation & Storage

From the pool of individuals participating in the study, 100 blood samples were procured from patients diagnosed with HIV. Each patient contributed 4ml of blood, which was collected meticulously into sterile EDTA tubes. The collected blood samples were promptly transported in an ice pack to the virology unit at the school. In the laboratory setting, the blood samples underwent centrifugation, following which serum samples were extracted using a micropipette. These serum samples were then preserved at a temperature of  $-20^{\circ}\text{C}$  until they were needed for examination.

### Assay Procedure

The examination was conducted utilizing a Rapid diagnostic test kit in strict adherence to the manufacturer's guidelines, ensuring precision and reliability. Before commencing the procedure, the workspace was thoroughly disinfected to minimize any potential contamination. Using a plastic pipette, precisely two or three globules of the sample were issued onto the designated sample particularly located on the cassette. Subsequently, one drop of buffer solution was added, initiating the diagnostic process. The

cassette was then allowed to incubate for a duration ranging from five to fifteen minutes to facilitate the result presentation. This particular rapid diagnostic test operates on the principle of lateral flow immunochromatography, utilizing a serum sample for analysis. Upon completion of the incubation period, the appearance of a double pink band signifies a positive test result, indicative of the presence of the targeted antigen. Conversely, the presence of a single pink band suggests a negative test result, indicating the absence of the antigen of interest. This straightforward yet effective method provides rapid and reliable screening for the specified condition, aiding in timely diagnosis and subsequent management.

## RESULTS

### Patients Characterization

This study is characterised by 100.0% HIV patients who were tested for *H. pylori* and *Treponema pallidum* infection, their age range was between 0-61 years and above. The samples were that of HIV patients who were in Capitol Hills Clinic Warri, for routine check. A cumulative number of 100 people with HIV were sampled in this study with their demographic characteristics stratified in Table 1.

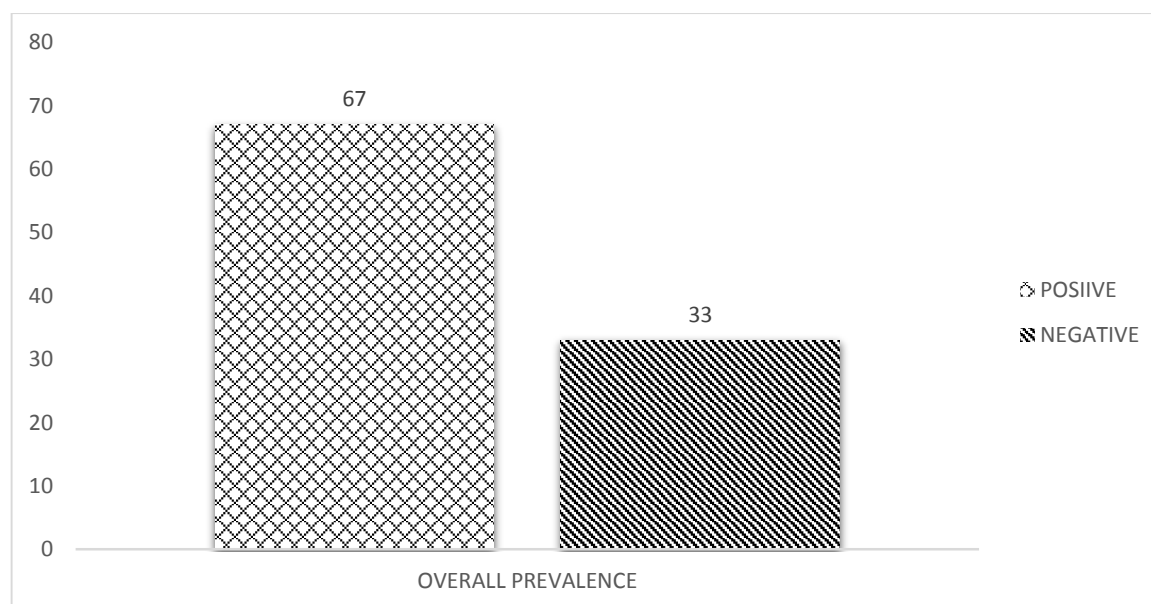
**Table 1 Socio-demographic of the studied HIV population**

Characteristics	Categories	No. Tested	No. Positive (%)
Age	0-20 years	22	15(68.0)
	21-40 years	48	34(71.0)
	41-60 years	16	9(56.2)
	61 & Above	14	9(64.3)
Sex	Females	55	36(65.0)
	Males	45	31(69.0)
Marital Status	Single	45	32(71.0)
	Married	55	35(64.0)
Occupation	Students	30	22(73.3)
	Traders	25	16(64.0)
	Civil servants	3	1(100.0)
	Employed	41	28(68.3)
	Unemployed	1	0(0.0)

Religion	Christian	93	63(67.7)
	Muslim	5	3(60.0)
	Traditionalist	2	1(50.0)
<b>Total</b>		<b>100</b>	<b>67(67.0)</b>

### Overall Ubiquity of *H. pylori* and *Treponema pallidum* poly infestation among HIV patients

Out of 100 persons tested, 67% tested positive for *H. pylori* and 33.0% tested negative. This, however, incites the ubiquity of *H. pylori* among HIV patients (Figure1)



**Figure1: Overall ubiquity of *H. pylori* and *Treponema pallidum* poly-infection among HIV patients**

#### Ubiquity of *H. pylori* and *Treponema pallidum* co-infection among HIV patients about Age

The research examines the presence of *H. pylori* infection in individuals with HIV, as depicted in Table 1. The findings reveal a higher prevalence among individuals aged 21-40 years, with 71% of this demographic testing positive for the infection. Following closely are those aged 0-20 years, with a prevalence rate of 68%, while individuals aged 61 years and above exhibit a prevalence of 64.3%. Lastly, the age group of 41-60 years demonstrates a prevalence of 56.2%. Nevertheless, despite these findings, there seems to be no notable connection between different age brackets and the frequency of *Treponema pallidum* infection among individuals with HIV.

#### Ubiquity of *H. pylori* and *Treponema pallidum* poly-infection among HIV patients concerning gender

The data indicates that males exhibited a higher prevalence rate of 69%, whereas females displayed a prevalence rate of 65%, as depicted in Table 1. Also, there was no relationship between gender and the ubiquity of Syphilis among HIV patients.

#### The ubiquity of *H. pylori* and *Treponema pallidum* dual infection among HIV patients about marital status

A higher prevalence was seen in those who are married at (71%). while those who are single showed (64%) as shown in Table 1. No correlation was found between marital status and the prevalence of Syphilis among individuals diagnosed with HIV.

### **The ubiquity of *H. pylori* and *Treponema pallidum* poly-infection among HIV patients with occupations**

The percentage of positive individuals concerning their occupations is as follows: civil servants (100.0%), students (73.3%), employed (68.3%), traders (64.0%), and unemployed (0.0%) this data is represented in Table 1.

### **The ubiquity of *H. pylori* and *Treponema pallidum* Poly-infection among HIV patients with Religion**

The data reveals that among the participants, Christians exhibited a higher ubiquity of Syphilis infestation, with 63 cases accounting for 67.7% of the total. Following Christians were Muslims, with 3 cases representing 60.0%, and Traditionalists with 1 case, accounting for 50.0%, as illustrated in Table 1. Yet, despite these distinctions, no apparent correlation was found between religious beliefs and the frequency of Syphilis infection among those diagnosed with HIV.

## **DISCUSSION**

The study probed into the ubiquity of *H. pylori* and *Treponema pallidum* amongst HIV-infected individuals in Warri, Nigeria, shedding light on the intersection of these infections within the context of HIV. *H. pylori* infection, as noted, is rampant in emerging nations, with incidence rates varying widely across regions and populations (Lee et al., 2003; Okonko et al., 2016; Ahaotu et al., 2023a,b; Innocent-Adiele et al., 2023; Okonko & Barine, 2023). This variance is intricately tied to socioeconomic factors and population density, as indicated by previous research (Abdolvahab et al., 2006; Okonko et al., 2016; Ahaotu et al., 2023a,b; Innocent-Adiele et al., 2023; Okonko & Barine, 2023). Socioeconomic status and living conditions, including factors like overcrowding, are influential in determining the prevalence of *H. pylori* infection. In developing nations, where a considerable segment of the populace resides in low or intermediate socioeconomic strata, the prevalence tends to be elevated (Waleed et al., 2010; Okonko et al., 2016; Ahaotu et al.,

2023a,b; Innocent-Adiele et al., 2023; Okonko & Barine, 2023). Additionally, *H. pylori* prevalence typically increases with age, although certain studies have noted declines within specific childhood age groups (Prescott et al., 2016). These dynamics underscore the complex interplay between socioeconomic factors, age, and the prevalence of *H. pylori* infection in populations across different regions (Okonko et al., 2016; Ahaotu et al., 2023a,b; Innocent-Adiele et al., 2023; Okonko & Barine, 2023).

This study, conducted among HIV-infected patients in Warri, Nigeria, provides significant insights into the frequency of *H. pylori* within this specific community subset. The findings, revealing that 67% of the HIV-infected patients tested positive for *H. pylori* are notable. This prevalence rate differs from previous reports in Nigeria, indicating a deviation from both lower and higher prevalence rates observed in other regions of the country (Okonko et al., 2016; Ahaotu et al., 2023a,b; Innocent-Adiele et al., 2023; Okonko & Barine, 2023). Although *H. pylori* are commonly associated with co-infections like HIV, dyspepsia, and anaemia, this study concentrated solely on patients with HIV (Ramadas et al., 1995; Magdy et al., 2012). The objective was to examine the prevalence of *H. pylori* within this group, while also taking into account socio-demographic factors such as gender, marital status, age, occupation, and religious affiliation.

Comparisons with previous studies underscore the significance of the findings (Lee et al., 2003). The prevalence rate of 67.0% reported in this study falls between the lower end reported by some researchers in Port Harcourt, Nigeria (Barine, 2014; Okosigha, 2014), and the higher rates reported in Kano, Nigeria (Bello et al., 2018), and elsewhere (Chen et al., 2014). Notably, the incidence rate noted in Warri, Nigeria (Jemikalajah & Okogun, 2014), this study stands higher than a previous report but lower than others, highlighting the variability in prevalence rates across different regions within the same country.

The study provides a comprehensive overview of the prevalence and implications of HIV/*H. pylori* coinfection, highlighting significant findings from various studies and regions. Firstly, it underscores the considerable diversity in *H. pylori* incidence across diverse geographical areas (Kusters et al., 2006), with developing countries showing higher rates, exceeding 80% even among young populations (Perez-Perez et al., 2004; Kusters et al., 2006). In contrast, industrialized nations generally exhibit lower prevalence rates, particularly in children and adolescents, with rates typically under 40% (Pounder & Ng, 1995; Perez-Perez et al., 2004; Kusters et al., 2006).

The study cited indicates a remarkably high coinfection rate of 67% for HIV and *H. pylori* among patients in Nigeria, contrasting sharply with a previous report suggesting a much lower prevalence of 2.0% in the same region (Barine, 2004). This discrepancy underscores the need for ongoing research to understand the factors contributing to such variations in prevalence.

Furthermore, the research delves into contradictory results concerning the likelihood of *H. pylori* in persons with HIV compared to those without it. While certain studies, like Abdollahi et al. (2014), indicate elevated levels of anti-*H. pylori* immunoglobulins in HIV-positive individuals, others propose reduced instances of *H. pylori* infection in HIV patients relative to the broader populace. These inconsistencies underscore the intricate nature of coinfection dynamics between HIV and *H. pylori*, emphasizing the necessity for additional research (Konturek, 2003; Perez-Perez et al., 2004; Kusters et al., 2006; Malaty, 2007).

The study explores the connection between HIV infection, the availability of highly active antiretroviral therapy (HAART), and the likelihood of developing non-AIDS-defined cancers, especially in older individuals (Ramadas et al., 1995; Prescott et al., 2005). It highlights the scarcity of data regarding the occurrence of gastric cancer among HIV-

positive patients, with differing rates observed in various geographical areas. Notably, research from Japan and Korea indicates higher incidences of gastric cancer in people living with HIV compared to the general population (Lee et al., 2018; Lim et al., 2018). Additionally, *H. pylori* infection emerges as a significant contributing factor, especially in regions like Korea where its prevalence is notably elevated (Lee et al., 2018; Lim et al., 2018).

The research offers a detailed investigation into the frequency of *H. pylori* infection among those with HIV in diverse geographic areas and demographic categories. It elucidates the multitude of factors that impact these rates of prevalence. One key aspect highlighted is the significant regional variation in *H. pylori* occurrence amongst HIV individuals. Studies from South-eastern Brazil, Taiwan, China, Iran, India, Ghana, Nigeria, and Ethiopia present a diverse range of prevalence rates, indicating a complex epidemiological landscape (Chiu et al., 2004; Perry et al., 2006; Lv et al., 2007; Werneck-Silva et al., 2007; Ejilude et al., 2011; Mynepalli et al., 2014; Nkuize et al., 2015; Sarfo et al., 2015; Teka et al., 2015; Anejo-Okopi et al., 2016; Spurnić et al., 2017). For instance, prevalence rates range from 17.3% in Taiwan (Chiu et al., 2004) to as high as 69.7% in Iran (Kafil et al., 2011), reflecting substantial differences across regions.

Age-specific prevalence patterns further contribute to the complexity of *H. pylori* contagion dynamics among HIV-infected individuals. While some studies indicate higher prevalence rates among specific age groups, such as individuals aged 21-40 years, others suggest lower rates in children compared to adults (Okosigha, 2014). These findings suggest that age may impact susceptibility to *H. pylori* infection, with different age cohorts exhibiting varying levels of vulnerability.

The observed disparities in *H. pylori* prevalence among HIV-infected individuals could be attributed to various factors,

including socioeconomic differences, environmental sanitation conditions, and variations in healthcare practices across countries. Additionally, differences in exposure to diverse populations based on occupation or business activities may contribute to variations in prevalence rates.

The gender disparity in the likelihood of *H. pylori* infection has been thoroughly investigated, and this research contributes by examining sociodemographic factors associated with the infection. Notably, our study's univariate analysis found a higher prevalence among males compared to females. This aligns with previous findings by Bello et al. (2018), Omosor et al. (2017), Woodward et al. (2000), and observations by Ford and Axon (2010), all reporting a similar trend of elevated *H. pylori* prevalence in males. This consistent pattern underscores the importance of considering gender in understanding and addressing *H. pylori* infections. Nevertheless, it's crucial to recognize that conflicting results exist, as evidenced by research from Warri, Nigeria, indicating a higher incidence of *H. pylori* among females (Jemikalajah & Okogun, 2014). These inconsistencies underscore the intricate nature of *H. pylori* epidemiology and highlight the impact of diverse factors that can differ among populations and geographic areas. Nonetheless, it's imperative to acknowledge the existence of conflicting findings, as indicated by research conducted in Warri, Nigeria, which suggests a higher occurrence of *H. pylori* among females (Jemikalajah & Okogun, 2014). These disparities underscore the intricate nature of *H. pylori* epidemiology and emphasize the impact of diverse factors that may vary across populations and geographic locations.

The proposed underlying mechanisms linking gender to *H. pylori* infection, including the modulation of gastrointestinal motility by estrogen and progesterone secretion (Xia et al., 2001), offer insights into the potential biological basis for gender disparities in *H. pylori* prevalence. However, further research

is needed to fully elucidate these mechanisms and their implications for clinical practice.

Regarding seroprevalence, while this study found a slightly higher seroprevalence among men compared to women, the variation was not statistically pronounced. This contrasts with findings from other studies, such as those conducted in Brazil (Fialho et al., 2011) and Nigeria (Anejo-Okopi et al., 2016), where the incidence of *H. pylori* infection was greater in women. These variations underscore the importance of considering regional and cultural differences when interpreting epidemiological data.

Additionally, the study identified a larger ubiquity of *H. pylori* among married HIV-infected individuals compared to singles, insinuating a relationship between marital status and *H. pylori* infection in this population. This finding aligns with previous research by Brenner et al. [60], who observed an increased danger of *H. pylori* infection with the duration of cohabitation with a partner already infected. The case described by Marshall and Adams (2008) further highlights the potential role of environmental factors, such as familial transmission, in *H. pylori* infection.

Socioeconomic status emerges as another critical factor influencing *H. pylori* occurrence among HIV-infected individuals (Hida et al., 1999; Malaty & Grahamin, 2017). Lower socioeconomic status is linked with a higher risk of *H. pylori* contagion, as evidenced by studies showing elevated prevalence rates among individuals from lower social classes (Hida et al., 1999; Malaty & Grahamin, 2017; Bello et al., 2018). Occupation also plays a role, with certain occupational groups exhibiting higher rates of *H. pylori* infection. However, the connection between occupation and prevalence may not always be statistically significant, suggesting the involvement of other contributing factors.

The connection between religion, *H. pylori* infection, and HIV presents a complex interplay, as illuminated by the results of this study. While the study identified varying

prevalence rates of *H. pylori* among HIV-infected patients based on religious affiliation, it did not establish a significant association between religion and the ubiquity of *H. pylori* in this population (Ahaotu et al., 2023b). Despite the lack of statistical significance, the observation of higher prevalence among Christian patients followed by Muslims and traditionalists offers intriguing insights into the distribution of *H. pylori* within different religious groups which aligned with previous studies in Nigeria (Ahaotu et al., 2023a; Innocent-Adiele et al., 2023), hinting at potential cultural and behavioral factors that may influence infection rates.

Additionally, the research provides insight into the widespread occurrence of HIV/*H. pylori* coinfection, emphasizing the ongoing requirement for thorough counselling and education concerning HIV transmission and coinfection. While the world enters the fourth decade of the HIV and AIDS pandemic, the substantial influence of this disease on human resources is obvious. While several studies have revealed that infection with *H. pylori* is less frequent among HIV-positive individuals having gastrointestinal symptoms, others have reported a heightened prevalence of *H. pylori* infection in HIV-positive patients due to suppressed immune systems (Moges et al., 2006; Lv et al., 2007; Luo et al., 2009; Fialho et al., 2011).

The connection between *H. pylori* infection and HIV is a topic of contention among researchers. Although this study indicates a greater occurrence of *H. pylori* in individuals with HIV, conflicting results exist within the scientific literature. For example, Moges et al. (2006) found a reduced prevalence of *H. pylori* infection in Ethiopian HIV-positive individuals compared to HIV-negative patients with stomach issues. This suggests that prevalence rates can vary significantly across different populations and environments.

Various mechanisms have been suggested to elucidate the differences in *H. pylori* prevalence among individuals with HIV. These include immune suppression, reduced

gastric acid secretion, and the rise of opportunistic infections like cytomegalovirus (CMV) (Luo et al., 2009; Abdollahi et al., 2014). These factors contribute to a multifaceted environment that can affect the colonization and persistence of *H. pylori* in the gastric mucosa of HIV-positive patients, potentially influencing disease progression and outcomes (Olmos et al., 2004; Lv et al., 2007; Abdollahi et al., 2014). However, it is important to acknowledge the limitations of the current study. Notably, the study did not evaluate CD4+ cell count and viral loads, critical parameters in assessing the severity and progression of HIV infection. Additionally, it did not investigate the connection between *H. pylori* prevalence and the phase of HIV disease or the specific antiretroviral regimens administered to patients, which could potentially influence infection rates and clinical outcomes. Nevertheless, despite these limitations, the results presented here are valid and tenable.

## CONCLUSION

The outcomes of this delve underscore the significant co-occurrence of *Helicobacter pylori* (*H. pylori*) and HIV infections, with a notably high co-infection rate of 67.0%. This statistic sheds light on the substantial burden imposed by dual infections, highlighting the complexity and interconnectedness of these two prevalent diseases within the population under study. Additionally, the study's revelation of a zero prevalence of *Treponema pallidum* and HIV coinfection in Warri, Delta State, Nigeria, offers valuable insight into the epidemiological landscape of sexually transmitted infections in the region. Furthermore, the study's spotting of *H. pylori* infection as a common and substantial health issue in Nigeria underscores the pressing need for proactive measures to address its prevalence and associated health risks. Given the high co-infection rate observed in this study, routine screening for both HIV and *H. pylori* coinfection emerges as a critical strategy for minimizing their transmission within the general population. By



implementing systematic screening protocols, healthcare providers can identify and intervene early in cases of coinfection, thereby reducing the burden of disease and mitigating potential complications.

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