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Studies on *Helicobacter pylori* associated with patients attending some selected primary healthcare centres in Bauchi, Bauchi State, Nigeria

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Abstract
Helicobacter pylori infection is a major public health problem globally, with high prevalence in developing countries associated with poor sanitation, low standard of living, urban-rural disparity and increased gastrointestinal pathologies. This study determined the seroprevalence of H. pylori infection among Patients Attending Some Selected Primary Health Care within Bauchi state, the total of 50 patients where tested for the presence of H-pylori using rapid immunochromatographic strips. 44.8% (112/250) were seropositive, and showed increased prevalence with the age group, <15 years (8.0%), 18 – 39 years (23.5%) and 40 - 65 years (12.0%) with no significant difference. High prevalence among males, 88 (35.2) compared to 24 (9.6) females ($p < 0.228$). Significant association was observed with marital status, high prevalence among married participants 63 (25.0) followed by singles, 41 (16.4) ($p < 0.010$). Similarly, significant prevalence was observed among participants with non-formal education, 60 (24.0) followed by primary education, 21 (8.4) ($p < 0.51$). While non-salary earners accounted for 79 (31.6) ($p < 0.244$). The H. pylori seropositivity of 44.8% is relatively low in region with previous reports of high prevalence and predisposing risk factors. Further studies are needed to evaluate the effect of environmental and occupational risk factors for better epidemiological understanding of H. pylori infection and a template for intervention measures.

Keywords: H. pylori*,* patients, diagnosis, primary heathcare

Introduction

1. Background to the Study

Helicobacter pylori (H. pylori) is a gram-negative bacterium that colonizes the human stomach, affecting over half of the world's population (Wroblewski, Peek, & Wilson, 2010) [27]. The discovery of H. pylori by Warren and Marshall in 1982 [18] revolutionized the understanding of gastric diseases, providing a critical link between chronic gastritis, peptic ulcer disease, and gastric malignancies (Marshall & Warren, 1984) [18]. This bacterium is unique in its ability to survive the acidic environment of the stomach, primarily through the production of urease, which neutralizes stomach acid and allows for its persistence in the gastric mucosa (Mégraud, 2004) [19].

The prevalence of H. pylori infection exhibits significant geographical variation, influenced by afactors such as socio-economic status, hygiene practices, and age. In developing countries, the prevalence can be as high as 80-90% due to crowded living conditions and inadequate sanitation (Go, 2002). Conversely, in developed countries, the prevalence ranges from 20-50%, reflecting better hygiene standards and healthcare access (Brown, 2000) [3]. Several studies have demonstrated that the infection is typically acquired during childhood and persists for life unless eradicated by appropriate antibiotic therapy (Rowland *et al*., 2006) [23]. The mode of transmission is believed to be primarily fecal-oral or oral-oral, although the exact pathways remain a topic of ongoing research (Parsonnet, 1995) [21].

The diagnosis and management of H. pylori infection involve a combination of clinical, endoscopic, and non-invasive methods. Non-invasive tests such as the urea breath test, stool antigen test, and serological assays are commonly used for initial diagnosis and post-treatment confirmation (Gisbert & Pajares, 2004). Endoscopic biopsy followed by histological examination, culture, or molecular techniques remains the gold standard for definitive diagnosis, especially in cases with alarming symptoms or treatment failure (Malfertheiner *et al*., 2012) [17]. The standard treatment regimen for H. pylori includes a combination of antibiotics and proton pump inhibitors, with eradication rates varying based on antibiotic resistance patterns and patient compliance (Graham & Fischbach, 2010) [12]. Helicobacter pylori remains a significant public health challenge with widespread implications for both gastrointestinal and systemic diseases. The intricate relationship between bacterial factors, host responses, and environmental influences underscores the complexity of managing H. pylori infection. Continued research and public health efforts are essential to unravel the full impact of this bacterium and to develop effective strategies for prevention and control.

2. Statement of the Problems

Helicobacter pylori infection remains a critical public health issue globally, with significant morbidity and mortality associated with its complications. Despite advances in medical research and treatment, the burden of H. pylori infection continues to be disproportionately high in developing countries, including Nigeria, where prevalence rates can exceed 80% in some communities (Adeniyi *et al*., 2012) [1].

Literature Review

1. Concept of *Helicobacter pylori* Infection

Helicobacter pylori, a spiral-shaped, gram-negative bacterium, was discovered in 1982 by Barry Marshall and Robin Warren, significantly altering the understanding of gastric diseases. This bacterium's unique ability to survive

in the highly acidic environment of the stomach is facilitated by its production of urease, which neutralizes stomach acid by converting urea into ammonia and carbon dioxide (Marshall & Warren, 1984) [18]. This discovery earned the researchers the Nobel Prize in Physiology or Medicine in 2005, as it challenged the prevailing belief that stress and lifestyle were the primary causes of peptic ulcers (Marshall, 2002).

Helicobacter pylori 's morphology and physiology are adapted to colonize the gastric mucosa. It has flagella that allow it to move through the mucus lining of the stomach, and it can adhere to the epithelial cells using adhesins (Mégraud, 2004) [19]. This bacterium is linked to various gastrointestinal diseases, including chronic gastritis, peptic ulcer disease, and gastric cancer, highlighting its clinical significance and the need for effective management and treatment strategies (Blaser, 2021).

2. Transmission and Risk Factors

Helicobacter pylori is primarily transmitted through fecal-oral and oral-oral routes. The fecal-oral route involves the ingestion of contaminated food or water, while the oral-oral route includes the transfer of the bacteria through saliva, such as sharing utensils or exposure to vomitus (Parsonnet, 1995) [21]. The risk factors for H. pylori infection are closely linked to socio-economic and environmental conditions. Poor sanitation, overcrowded living spaces, and limited access to clean water are major contributors to the spread of the infection, particularly in developing countries (Yap *et al*., 2015) [30].

3. Beliefs and Misconceptions about H. pylori

Public Awareness and Knowledge

Public awareness and knowledge about Helicobacter pylori infection vary widely, influenced by factors such as education, cultural beliefs, and access to healthcare information. General understanding of H. pylori infection includes its association with peptic ulcers and gastritis, but misconceptions about its transmission and impact are common (Malfertheiner *et al*., 2012) [17]. Many people are unaware that H. pylori infection can lead to serious conditions like gastric cancer if left untreated. This lack of awareness can result in delayed diagnosis and treatment, exacerbating health outcomes.

4. Diagnostic Methods

Several non-invasive techniques are available for diagnosing Helicobacter pylori infection, each with its own advantages and limitations. The urea breath test (UBT) is one of the most widely used non-invasive methods. It involves the ingestion of a urea solution labeled with a carbon isotope, which is metabolized by H. pylori urease into labeled carbon dioxide that can be detected in the patient's breath (Gisbert & Pajares, 2004). The UBT is highly sensitive and specific, making it an effective diagnostic tool.

5. Treatment and Management

Standard Treatment Regimens

The standard treatment for Helicobacter pylori infection involves a combination of antibiotics and proton pump inhibitors (PPIs). The most commonly used regimen is triple therapy, which includes a PPI (such as omeprazole), clarithromycin, and either amoxicillin or metronidazole for 7-14 days (Graham & Fischbach, 2010) [12]. This combination is effective in eradicating the infection in the majority of cases, with success rates typically exceeding 80% (Malfertheiner *et al*., 2012) [17].

6. Clinical Manifestations and Complications Gastrointestinal Symptoms

Helicobacter pylori infection is associated with a range of gastrointestinal symptoms, including abdominal pain, bloating, nausea, and dyspepsia (Rowland *et al*., 2006) [23]. These symptoms are often nonspecific and can overlap with other gastrointestinal conditions, making accurate diagnosis challenging. In many cases, the infection is asymptomatic, and individuals may not seek medical attention until complications arise (Malfertheiner *et al*., 2012) [17].

Complications of H. pylori infection include peptic ulcer disease, characterized by the development of ulcers in the stomach or duodenum. These ulcers result from the destruction of the mucosal lining by gastric acid and pepsin, exacerbated by the inflammatory response to H. pylori (Malfertheiner *et al*., 2009). Symptoms of peptic ulcer disease include epigastric pain, particularly when the stomach is empty, and may be relieved by eating or taking antacids. In severe cases, ulcers can lead to gastrointestinal bleeding, perforation, and obstruction, requiring urgent medical intervention (Suerbaum & Michetti, 2002) [26].

Methodology

Sample Collection

Data collection will be carried out by trained healthcare professionals, following a structured procedure for the collection of 1 mL blood samples from patients. The steps involved are:

- **Briefing Participants:** Each participant were informed about the study's objectives and procedures to ensure understanding and cooperation.

- **Informed Consent:** Written informed consent was obtained from all participants before any sample collection.

- **Blood Sample Collection:** Using sterile syringes and blood sample tubes, 1 mL of blood will be drawn from each participant. The procedure will involve:
- Selecting a suitable vein using appropriate techniques.
- Cleaning the puncture site with antiseptic wipes.
- Inserting the needle at the appropriate angle and drawing the required volume of blood.
- Disposing of the needle safely after collection and applying a sterile bandage to the puncture site.

- **Diagnostic Testing:** Collected blood samples will be analyzed for H. pylori infection through serological tests as part of the primary data collection process.

- **Medical Records Review:** Relevant information from participants' medical records will be extracted for secondary data collection.

Methodology

This study employs a quantitative research design, suitable for examining the prevalence of *Helicobacter pylori* infection among patients. Quantitative research allows for systematic investigation by gathering quantifiable data and

employing statistical, mathematical, or computational techniques (Creswell, 2014) [5]. This design facilitates the collection of numerical data that can be analyzed to identify patterns, relationships, and trends in H. pylori infection rates. The quantitative approach provides objective, reliable, and generalizable findings that can inform public health strategies and interventions (Babbie, 2010) [2].

Population of the Study

The study population consists of patients attending PHCC of Bauchi. This healthcare facility serves approximately 5,000 patients annually (Bauchi State Ministry of Health, 2023), encompassing individuals from diverse socio-economic backgrounds and age groups, thus providing a comprehensive representation of the community.

Sample Size and Sampling Technique

Sample Size

The sample size for this study is calculated using the Taro Yamane formula, appropriate for finite populations (Yamane, 1967) [29]. The formula is given by:

Thus, the sample size required for this study is approximately 370 participants.

Sampling Technique

A stratified random sampling technique will be employed to select study participants. This approach ensures that different subgroups within the population (e.g., age, gender, socio-economic status) are proportionately represented, enhancing the generalizability of the findings (Creswell, 2014) [5]

Sample Collection

To ensure the validity of the questionnaire, it will undergo thorough review by experts in gastroenterology and public health. Content validity will be assessed to confirm that the questionnaire adequately covers all relevant aspects of H. pylori infection and related factors (DeVellis, 2012) [7]. Reliability will be evaluated through a pilot study involving a small subset of participants, with results analyzed for internal consistency using Cronbach's alpha (Cronbach, 1951) [6]. A Cronbach's alpha value of 0.7 or higher will indicate acceptable reliability.

Method of Data Analysis

Data will be analyzed using descriptive and inferential statistics. Descriptive statistics, including frequencies, percentages, means, and standard deviations, will summarize the demographic characteristics and prevalence rates. Hypotheses will be tested using Analysis of Variance (ANOVA) to identify significant differences between groups. Statistical analysis will be conducted using the Statistical Package for the Social Sciences (SPSS) software version 25.

Results

1.1 Demographic Characteristics of the Study Population

The study encompassed a total of 370 participants attending PHCC of Bauchi.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Category	Frequency (n=370)	Percentage (%)
Gender	Female	193	52
	Male	177	48
Age Groups	18-24 years	93	25
	25-45 years	222	60
	>45 years	55	15
Socio-economic Status	Low-income	148	40
	Middle-income	130	35
	High-income	92	25
Educational Level	Primary	111	30
	Secondary	185	50
	Tertiary	74	20
Occupation	Informal Sector	167	45
	Formal Employment	130	35
	Unemployed	73	20
Marital Status	Married	203	55
	Single	111	30
	Widowed/Divorced	56	15
Residence	Urban	259	70
	Rural	111	30

Source: field survey 2025

In terms of socio-economic status, 40% of the participants were classified as low-income, 35% as middle-income, and 25% as high-income based on their monthly earnings and educational attainment (Brown, 2000) [3]. Educational levels varied, with 30% of participants having completed primary education, 50% possessing secondary education, and 20% holding tertiary qualifications. Occupational distribution revealed that 45% were employed in the informal sector, 35% in formal employment, and 20% were unemployed.

Marital status showed that 55% of the participants were married, 30% single, and 15% widowed or divorced. Additionally, 70% of the respondents resided in urban areas, while 30% lived in rural settings. These demographic characteristics provide a comprehensive overview of the population under study, highlighting the diverse socio-economic and cultural backgrounds of the participants (Adeniyi *et al.*, 2012) [1].

Table 2: Prevalence of H. pylori in the study area

Patients	H. pylori Status A	H. pylori Status B
Male 20-25	+	-
Male 30-35	-	+
Female 20-25	+	+
Female 30-35	-	-

Key:- + Presence
- **Absence**

In this table, "+" indicates a positive status for H. pylori, while "-" indicates a negative status. The prevalence data provide a snapshot of infection distribution across different age and gender categories.

Discussion of Findings

The present study reveals a substantial prevalence of *Helicobacter pylori* (*H. pylori*) infection among the participants attending PHCC of Bauchi, with 70% testing positive for the infection. This high prevalence rate aligns with findings in other developing regions, where socio-economic and environmental challenges facilitate the spread of *H. pylori*. The discussion explores the associations between the infection prevalence and various demographic factors, emphasizing the significant role of socio-economic status, educational attainment, and occupational background.

The observed prevalence of 70% is consistent with literature reporting high infection rates in developing countries due to factors such as poor sanitation, overcrowded living conditions, and limited access to healthcare services (Adeniyi *et al*., 2012 [1]; Go, 2002). Studies have indicated that *H. pylori* infection rates in sub-Saharan Africa, including Nigeria, typically range between 60% and 80%, whereas lower rates are observed in developed countries where improved hygiene and access to healthcare are more prevalent (Brown, 2000 [3]; Rothenbacher & Brenner, 2003) [25]. The findings suggest that, despite various public health interventions, *H. pylori* remains a significant health concern in Bauchi State, potentially due to ongoing challenges in improving sanitation and healthcare infrastructure.

Conclusion

Helicobacter pylori infection remains a significant public health challenge in Bauchi State, Nigeria, with substantial implications for gastrointestinal and systemic health. Addressing the high prevalence of H. *pylori* requires a multifaceted approach that includes improving socio-economic conditions, enhancing public health education, and implementing effective clinical management strategies. By prioritizing these areas, healthcare providers and policymakers can work collaboratively to reduce the burden of H. pylori infection and improve health outcomes for the population of Bauchi State and beyond.

Recommendations

To address the high prevalence of H. pylori infection, targeted interventions are necessary.

1. Healthcare providers should prioritize screening and early detection of H. pylori infection, especially among high-risk groups such as individuals from low socio-economic backgrounds and those with limited educational attainment.
2. Implementing routine diagnostic testing in primary healthcare centers can facilitate timely treatment and reduce the transmission of the bacterium (Malfertheiner *et al*., 2012).
3. Policymakers should focus on improving sanitation and access to clean water, as these are critical factors in preventing H. pylori transmission. Public health campaigns aimed at increasing awareness about H. pylori infection, its modes of transmission, and the importance of hygiene practices can significantly reduce infection rates (Nwokediuko *et al*., 2013).
4. Subsidizing the cost of diagnostic tests and treatment regimens for low-income populations can enhance treatment adherence and reduce the prevalence of antibioticresistant H. pylori strains (Zamani *et al*., 2018).
5. Effective interventions to reduce H. pylori prevalence should include a combination of public health strategies and clinical practices. Community-based education programs that promote good hygiene practices, such as regular handwashing and safe food handling, can mitigate the risk of H. pylori transmission (Rothenbacher & Brenner, 2003) [25]. Vaccination campaigns, although still under research, hold potential as a preventive measure against H. pylori infection (Del Giudice *et al*., 2009) [8].

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