Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Medical Laboratory Science

Evaluation of Knowledge, Perception and Prevalence of *Helicobacter pylori* Infection among Students of Enugu State University of Science and Technology: A Multi-Disciplinary Approach

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DOI: 10.36347/sjams.2022.v10i10.007 | **Received:** 24.08.2022 | **Accepted:** 30.09.2022 | **Published:** 04.10.2022

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Abstract **Original Research Article**

Background: The increasing prevalence *of Helicobacter pylori* infection globally has become a huge concern. This organism is a gram-negative bacterium that infects the lining of the stomach, causing peptic ulcer disease as well as gastric cancer. Approximately 50% of the world populations are known to be infected with *Helicobacter pylori*.This study evaluated the knowledge, perception as well as prevalence of *Helicobacter pylori among the students of* Enugu State University of Science and Technology (ESUT). A total of 1,500 who fulfilled the inclusion criteria were recruited for the study. Ethical clearance and informed consent were retrieved and a well-structured questionnaire was administered to each participant. Blood samples were collected from the participants and screened for *Helicobacter pylori* antibody using rapid test kits (CTK Biotech, Inc., San Diego, USA). Information obtained was analysed using SPSS version 25.0. P-values <0.05 were reflected as statistically significant. Out of the 1,500 students tested, 964 (64.3%) were positive for *H. pylori*. The prevalence was higher in females 896 (59.7%) as against 604 (40.4%) in males. The students within the age group of 20-24 years reported the highest prevalence. There was no statistical significance in the prevalence of *Helicobacter pylori* between the age groups (P=.370) and gender groups (P=.927). Based on evaluation of knowledge and perception of *Helicobacter pylori* among ESUT students, 1365 (91%) had heard of ulcer but only 577 (38.5%) had been diagnosed of ulcer previously. Majority of the student participants (65.7%) knew antacid as a medication for ulcer. About half the population (50.5%) perceived that ulcer is related to weight loss. 36.5% believed ulcer could bring about lack of concentration while 36.8% agreed that ulcer makes one highly irritable. ***Conclusion:*** The purpose of this work was to generate information with emphasis on the prevalence of *Helicobacter pylori* among the study population as well as their knowledge and perception. Information generated will help formulate public health interventions necessary to check these problems and offer evidence based preventive approach to the students of ESUT and the entire populace.

Keywords: *H. pylori,* ulcer, students, knowledge, perception, prevalence.

1. INTRODUCTION

Helicobacter pylori (HP) is a common infection and causes Peptic Ulcer Disease (PUD) as well as gastric cancer worldwide (Feder et al., 2018; Basso et al., 2010; Obeagu and Aloh, 2014). In addition, *H,pylori* infection is implicated in PUD complications (such as bleeding) as well as extra-gastroduodenal diseases like acute coronary syndrome, neurodegenerative diseases, metabolic syndrome, idiopathic thrombocytopenic purpura, and vitamin B12 deficiency (Tarasconi et al., 2020, Mahachai et al., 2018). It has been estimated that 78% of all gastric cancer cases, and 89% of non-cardiac cases, can be attributed to chronic *H. pylori* infection (Zhang, 2014).

The development of gastric cancer from *H. pylori* which involves a multistep process from chronic gastritis to atrophic gastritis to intestinal metaplasia to dysplasia to gastric cancer, can take decades to develop. This slow progression provides an opportunity for early detection and treatment of *H. pylori*, leading to the prevention of gastric cancer. Although the route of transmission of *H. pylori* infection is not clearly known, some evidences indicate that faecal contaminated water and food, faecal-oral contact and kissing are sources of infection (Goh *et al*., 2011). The infection is often acquired during childhood and persists throughout life; remaining dormant for an extended period of time, and disease manifestations not appearing up to adulthood. The majorities of infected people are unaware of their infection status and continue to be infectious to others. Only some people develop illness, most of the time in adulthood (Korkmaz *et al*., 2013).

Contributing factors for *H. pylori* infection are related to socio-demographic characteristics, personal and environmental hygiene, life style of the population, genetic predisposition and socioeconomic status (Dube *et al*., 2009). Symptoms of *H. pylori* infection includes: pain or discomfort (usually in the upper abdomen), bloating, feeling full after eating a small amount of food, lack of appetite, nausea or vomiting, dark or tar-colored stools, ulcers (Crowe, 2018). These symptoms also have resultant psychological effects such as psychological distress, anxiety and depressive mood on the patients (Takeoka *et al*., 2017).

The prevalence of *H. pylori* varies between and within countries with reference to age, ethnicity, race and geographical location. This prevalence ranges from 30 to 40% in the United States and 70 to 90% in Africa (Adeniyi *et al*., 2012). Early detection of *H. pylori* infection might prevent peptic ulcer disease and associated complications. Recently, a high burden of *H. pylori* infection (70.1%) has also been reported in Africa (Smith *et al*., 2019). Due to the increase in the prevalence of *H. pylori* resistance to antibiotics, triple therapy with clarithromycin is no longer the best treatment. Current treatments involve the use of novel antibiotics or classical ones in different combinations, others therapies are using probiotics associated to antibiotics to treat this infection (Goderska *et al*., 2018).The primary aim of this study is to assess the prevalence, general knowledge and perception of *H pylori* amonng the students of Enugu State University of Science and Technology in a multidisciplinary manner.

2. MATERIALS AND METHODS

2.1 Study Area

The two campuses of ESUT: Agbani and Parklane, were chosen as the study area for this research work. These areas were selected because of the possible overcrowdings among students and also for their diverse cultural, demographic and socio-economic representations, which are major factors that influence the spread/distribution of *Helicobacter pylori* infection. The study was conducted among ESUT students from the two campuses.

2.2 Study Design

This is a cross sectional study and was carried out between March 2022 and September 2022.

2.3 Study Participants

A total of 1,500 students (1000 from Agbani Campus and 500 from Parklane) of both sexes were recruited for this study. These were the students that fulfilled the inclusion criteria.

2.4 Inclusion Criteria

Participants included in this study must be students of ESUT from either of the campuses and aged 15 and above. They must have properly given their consents and filled the questionnaires. They must also have agreed to blood sample collection.

2.5 Exclusion Criteria

Participants were excluded from this study if they: were <15 years of age, declined to properly fill the questionnaires or consent forms, refused to have their blood samples collected.

2.6 Questionnaire Administration

A well structured questionnaire was used for the study. It assessed participant's knowledge, perception and demographic characteristics. The first part of the questionnaire contained questions on demography (age, gender, occupation). The second part was based on the participant's knowledge and perception of *H. pylori* and peptic ulcers. The questionnaires were filled by the students after a short introduction about the study.

2.7 Sample Collection and Processing

2ml of fresh blood was collected from each participant into plain vacutainer tubes by venipuncture under asceptic conditions. Samples were left to clot at a minimal room temperature and spun at 3,000 rpm for 5 minutes. All sera were tested for *H. pylori* antibody (IgG) presence using the one-step *H. pylori* antibody quick diagnostic screening kit (CTK Biotech, Inc., San Diego, USA). The test protocol and results were done according to manufacturer's instruction. The test kit and other reagents were brought to room temperature. The test cassette was placed on a clean surface and 2 drops of serum were added to the specimen well. Reading was done at 10 minutes.

2.8 Interpretation of Test

The presence of two colour bands (test and control bands) within the result window indicated a positive result. The presence of only the control band indicated a negative result while the presence of only the test line made the test cassette invalid. Also if there

were no test and control bands, the test was considered invalid and the sample retested.

2.9 Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version (SPSS, v.25) and Microsoft Excel. Chi square test (X^2-value) was used to determine the prevalence of *H. pylori* infection in the participants and the difference in the prevalence across gender and age. Analysis of relationships between dependent and independent variables was at 95% confidence interval and a P value ≤0.05 will be considered statistically significant.

3. RESULTS

Table 1 presents the respondents' demographic characteristics. Their age mean and standard deviation was 23.36±5.13, and their modal age group, 20-24 years (77.9%). The infection was highest in this age group when compared to other age groups. The majority of the participants were females (59.7%) while (40.4%) were males. More than two-thirds were single (88.9%).

Table 1: Demographic Characteristics of the Respondents n = 1500

	Frequency	Percent	M±SD
Age			23.36±5.13
15-19	61	4.1	
20-24	1168	77.9	
25-29	211	14.1	
30-34	15	1.0	
35-39	15	1.0	
40-44	15	1.0	
60-65	15	1.0	
Gender			
Male	604	40.3	
Female	896	59.7	
Marital status			
Single	1333	88.9	
Married	152	10.1	
Widow	15	1.0	

Analyses in Table 2 present the respondents' knowledge and perception of peptic ulcer. Almost all the respondents have heard of peptic ulcer (91.0%); majority (70.7%) knew that it is a wound in the stomach. 38.5% of the respondents have been diagnosed of ulcer previously; 67.9% have been in close relationship with ulcer patient (67.9%). Less than half the population of participants knew that peptic ulcer is caused by bacteria in the stomach (45.4%). Perceived effects of peptic ulcer majorly included: loss of weight (50.5%), highly irritable (36.8%) and lack of concentration (36.5%). More than half of the study participants (57.8%) knew that heartburn is a symptom of peptic ulcer while less than one-fourth of the study population (20.3%) thought blood in stool was a symptom of peptic ulcer. Majority knew that taking antacid is a medication for peptic ulcer patient (65.7%); about one-third knew about taking omeprazole (37.5%) and few, antibiotics (15.3%).

Table 2: Knowledge and Perceptions of Peptic ulcer n = 1500

	Frequency	Percent
Have you heard of ulcer		
- Yes	1365	91.0
- No/don't know	135	9.0
What is ulcer		
- Acid in the stomach	485	32.3
- Bacteria in the stomach	317	21.1
- Wound in the stomach	1061	70.7
- Dirty stomach	15	1.0
Have you been diagnosed of ulcer		
- Yes	577	38.5
- No/don't know	923	61.5
Have you been in close relationship with ulcer patient		
- Yes	1018	67.9
- No/don't know	482	32.1

What causes ulcer		
- Eating food containing excess pepper	440	29.3
- Taking drugs like pain killers (Ibuprofen)	258	17.2
- Taking acidic food or drinks	516	34.4
- Bacteria in the stomach	681	45.4
What effect does ulcer has on its patients		
- Lack of concentration	548	36.5
- Loss of weight	758	50.5
- Depression	307	20.5
- Anxiety	324	21.6
- Highly irritable	552	36.8
- Trauma	320	21.3
In your opinion, what are the symptoms of stomach ulcer		
- Heart burn	867	57.8
- Blood in stool (dark stool)	305	20.3
- Nausea/vomiting	410	27.3
- Pain at the back	605	40.3
- Unexpected weight loss	471	31.4
In your opinion, what medication should someone who is experiencing ulcer take		
- Take an antacid (eg gestid, gelusil etc)	986	65.7
- Drink milk/yoghurt	440	29.3
- Eat food immediately	333	22.2
- Take omeprazole	563	37.5
- Take antibiotics	229	15.3

From Table 3, majority of the respondents have heard of *Helicobacter pylori* (61.9%); almost average knew it is a bacteria (47.5%). Those who knew *H. pylori* could be transmitted from one person to another were few (23.4%) while a higher percentage of the study population (76.6%) did not know. 12.3% knew about fecal-oral route of transmission, and 6.1%, kissing. Less than half perceived there is an association between ulcer and *H. pylori* (48.8%) while few perceived that *H. pylori* could cause cancer (20.2%).

Table 3: Knowledge and Perceptions of *Helicobacter pylori* n = 1500

	Frequency	**Percent**
Have you heard of *Helicobacter pylori*		
- Yes	928	61.9
- No/don't know	572	38.1
What is *Helicobacter pylori*		
- Virus	16	1.1
- Parasite	107	7.1
- Fungi	30	2.0
- Bacteria	713	47.5
- Acid in the stomach	62	4.1
- Don't know	572	38.1
In your opinion can *H. pylori* be transmitted from one person to the other		
- Yes	351	23.4
- No/don't know	1149	76.6
What do you think is the transmission route of *Helicobacter pylori*		
- Fecal oral route	184	12.3
- By inhalation	45	3.0
- Through kissing	92	6.1
- I don't know	1179	78.6
In your opinion, is there an association between *Helicobacter pylori* and ulcer		
- Yes	732	48.8
- No/don't know	768	51.2
In your opinion, can H pylori cause cancer		
- Yes	303	20.2
- No/don't know	1197	79.8

From Table 4, findings shows that the prevalence of *H. pylori* was 64.3%; 35.7% of the participants were negative. Out of a total of 1500 students consisting of 40.3% males and 59.7% females that were screened for *H. pylori* antibody, 64.3% showed positivity while 35.7% were negative (Figure 1).

Table 4: Prevalence of *H. Pylori* n = 500

	Frequency	Percent
***H. pylori* result**		
Positive	964	64.3
Negative	536	35.7

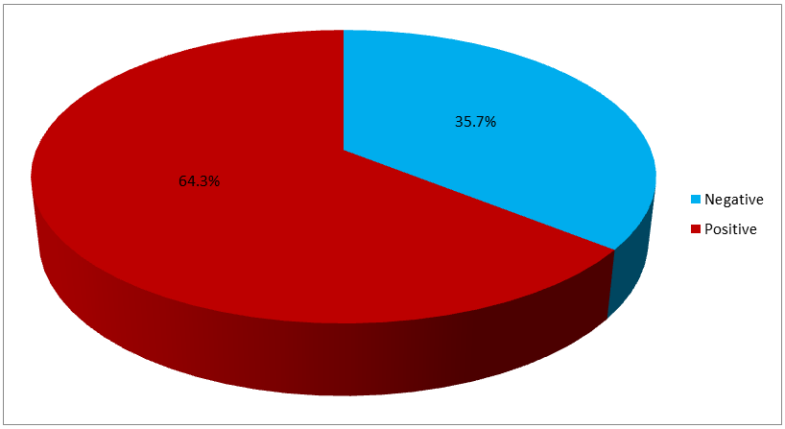

Figure 1: Prevalence of *H. pylori*

Table 5 showed that there was no significant difference in prevalence of *H. pylori* between the age groups (p = .370), gender groups (p = .927) and marital statuses (p = .590). Prevalence across the groups and statuses were comparable; all had prevalence above 50%.

Table 5: Prevalence of *H. pylori* across Age Groups, Gender Groups and Marital Statuses

	H. pylori			**Chi-square**	**p-value**
	Positive	**Negative**	**Total**		
Age				6.496	.370
15-19yrs	37(60.7)	24(39.3)	61		
20-24yrs	739(63.3)	429(36.7)	1168		
25-29yrs	148(70.1)	63(29.9)	211		
30-34yrs	8(53.3)	7(46.7)	15		
35-39yrs	10(66.7)	5(33.3)	15		
40-44yrs	12(80.0)	3(20.0)	15		
60-65yrs	10(66.7)	5(33.3)	15		
Gender				.008	.927
Male	389(64.4)	215(35.6)	604		
Female	575(64.2)	321(35.8)	896		
Marital status				1.056	.590
Single	862(64.7)	471(35.3)	1333		
Married	92(60.5)	60(39.5)	152		
Widow	10(66.7)	5(33.3)	15		

From Table 6, only age (p = .015) and marital status (p = .037) significantly predicted *H. pylori* in a logistic regression analysis (p = .049). For age, the odds of being positive was 1.271 [1.047-1.544] times higher in each succeeding age group: 15-19 years, 20-24 years, 25-29 years … For marital status, the odds was .652 [.436-.997] times and .112 [.016-.801] times higher among the married and the widowed respectively when compared with the singles; the singles hence had higher odds of being positive than the married (1.534 times) and the widowed (8.929 times).

Table 6: Predictors of *H. pylori*

	OR	p-value	95% CI for OR	
			Lower	Upper
Model (χ^2 = 16.968)		.049		
Gender	1.081	.516	.855	1.365
Age	1.271	.015	1.047	1.544
Marital status		.037		
single vs. widowed	.112	.029	.016	.801
single vs. married	.652	.038	.436	.977
Awareness (heard) of ulcer	1.459	.088	.945	2.251
Knowledge that ulcer is bacteria in the stomach	.906	.470	.692	1.185
Once diagnosed of ulcer (history)	1.202	.129	.948	1.525
Awareness (heard) of *H. pylori*	1.123	.370	.872	1.445
Knowledge that *H. pylori* is a bacteria	.879	.333	.676	1.142
Constant	.579	.235		

4. DISCUSSION

Helicobacter pylori infection has been estimated at 50% of the world's population and this is a major public health concern (Mladenova, 2021). This current study was conducted to evaluate the knowledge, perception and prevalence of *H. pylori* among students of Enugu State University of Science and Technology. A total of 1500 students were recruited for the study. In this study, the higher proportion of students was in the age group of 20-24 (77.9%), females (59.7%) and single (88.9%). There was no statistical association between gender, age groups, marital statuses and *H. pylori* infections (p> 0.05). Based on gender, both males (64.4%) and females (64.2%) were almost equally affected and this was not significant (p = 0.927). This is consistent with the reports of Oti *et al.,* (2021) among students of Tertiary institution, Nasarawa and Ombugadu *et al.,* (2018) among dyspeptic patients in Jos. In addition, no association was established between *H. pylori* infection and marital status (p= 0.590). The prevalence in this study according to the marital statuses for single married and widowed were 64.7%, 60.5% and 66.7% respectively. This agrees with the reports of Oti *et al.,* (2021) and Enitan *et al.,* (2018). The variations in the participants' demographic characteristics in this study and in different locations may explain the differences in the knowledge and perception levels.

A part of the study assessed their knowledge and perception regarding *H. pylori*. The overall level of knowledge and perceptions of ulcer and *H. pylori* was above average. This is similar to findings on knowledge of *Helicobacter pylori* among students reported in Saudi Arabia (Hafiz *et al*., 2021). This could be attributed to the medical students in Parklane campus who had undergone courses in Microbiology and Bacteriology and as such may have been exposed to some information on *H. pylori* infection. It may also be attributable to the knowledge gained in about one-third of the study participants (38.5%) that had previously being diagnosed of *H. pylori* infection. Contrary to the findings in the present study, poor knowledge of *H. pylori* was reported among Physicians and students in a national survey in China (Wu *et al*., 2020), Korea (Shin *et al*., 2013) and among the general population of United Arab Emirates (Malek *et al*., 2017). This study also found out that 91% of the students had heard of stomach ulcer while 61.9% had heard of *H. pylori*. It is already an established fact that *H. pylori* are a risk factor for the development of stomach ulcers (Kouitcheu *et al*., 2018). This high level of knowledge is comparable to the study conducted by Hafiz *et al.,* (2021) in Saudi Arabia where most of the students (76.9%) reported having heard about *H. pylori*. With regards to symptoms of *H. pylori* infection, 57.8% of the study participants knew about heart burn. Other symptoms such as blood in stool, nausea/vomiting, epigastric pain were 20.3%, 27.3% and 40.3% respectively. This is in consonance with the knowledge levels depicted in the work of Shin *et al.,* (2013) in Korean population. This knowledge may be because of the common signs and symptoms of *H. pylori* infection seen among the population as well as the level of education of the participants within the study area.

Helicobacter pylori in peptic ulcer disease have a lot of psychological implication. In the present study where students were the participants, certain psychological effects were identified. These included:

lack of concentration (possibly due to discomfort and pain) (36.5%), depression (20.5%) and anxiety (21.6%). All these effects are capable of affecting the student's productivity. These findings are similar to the 7 year review of Al Quraan *et al.*, (2019) and an observational study in Japan by Takeoka *et al*., (2017). Both studies established an association between the aforementioned psychological effects and *H. pylori* (in peptic ulcers). In addition, a study by Tian *et al.*, (2022) on mice demonstrated that H pylori could induce anxiety-like and depression-like behaviours in mice infected with *H. pylori*. This has shown a clear association between psychiatric disorder and *H. pylori* infection.

The prevalence of *H. pylori* within the study population is 64.3% and this is higher than the 57.9% recorded in North-Central, Nigeria by Oti *et al.*, (Oti *et al*., 2017), 41.5% among students population of Nasarawa State university, Keffi (Oti *et al*., 2021) and 28% reported by Enitan *et al.*, (2018) among students of Tertiary institution in Ogun. The differences in the prevalence rate of *H. pylori* infection observed in different studies may be due to difference in population type and location with different peculiar risk factors. The high prevalence in this study may be attributed to the fact that a good number of these students reside in the hostels where there is usually overcrowding and poor hygienic conditions which are risk factors in the transmission of *H. pylori* infection.

5. CONCLUSION

This study confirmed a high prevalence of *H. pylori* among students of Enugu State University of Science and Technology. Proper sanitary measures, mass awareness and education will go a long way in reducing this prevalence. Further studies are needed in assessing the psychological effects of *Helicobacter pylori* infection among students.

6. LIMITATIONS OF THE STUDY

This study was limited to a population of students of the institution and may not be a true representation of the entire population.

CONFLICT OF INTERESTS

The authors declared no any competing interests.

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