





# Helicobacter pylori infection: Knowledge and attitudes of college students in South Darfur State, Sudan

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**Background.** *Helicobacter pylori* infection is a significant global health issue, affecting ~4.4 billion individuals worldwide in 2015, ~60% of the world's population at that time. Knowledge and attitudes regarding *H. pylori* among college students remain poorly understood.

**Objectives.** To assess knowledge and attitudes of college students regarding *H. pylori* infection.

**Methods.** A cross-sectional study of 323 participants from a college population was conducted from March to April 2023.

**Results.** Of the 323 participants, (42.7%) were male and (57.3%) were female. The majority of the students (86.4%) lived in urban areas, as opposed to 12.1% in rural areas. Overall, the participants demonstrated good knowledge about *H. pylori*; 87.3% knew that it is a bacterium that causes peptic ulcers, and 57.0% were aware that it can cause cancer. Personal reading was the most common source of information (44.0%), followed by mass media (31.3%) and social media (24.8%). Most participants (87.9%) believed that *H. pylori* infection can be treated with medication ('tablets'). Just over half (50.2%) had undergone testing for *H. pylori*. The diagnostic investigation that most participants would prefer was the stool antigen test (36.5%), followed by a blood test (26.9%), the urea breath test (9.0%) and endoscopy (6.5%). While most of the participants demonstrated a reasonable understanding of *H. pylori* infection, some knowledge gaps were identified.

**Conclusion.** The study findings highlighted the importance of implementing targeted education programmes to address the knowledge gaps identified among college students.

**Keywords.** *Helicobacter pylori*, knowledge, attitudes, Darfur College, cross-sectional, South Darfur

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*Helicobacter pylori* infection remains a serious global public health issue.<sup>[1]</sup> It is recognised as one of the most common chronic bacterial infections worldwide,<sup>[2]</sup> and can cause conditions ranging from chronic gastritis and peptic ulcer disease to more severe complications.<sup>[3]</sup> The disease affected ~4.4 billion individuals in 2015, ~60% of the world's population at that time, with a disproportionate burden in developing countries.<sup>[2,4-6]</sup>

The pathogen *H. pylori* is the primary risk factor for gastric cancer, a cancer that is linked to ~800 000 deaths annually.<sup>[7]</sup> The prevalence of infection can be >80% in middle-aged patients in developing countries,<sup>[8]</sup> although rates are not consistent. For instance, studies have revealed prevalences of 36.0% among Sudanese medical students in Shendi,<sup>[9]</sup> 23.4% among Iraqi

students,<sup>[10]</sup> and ≥43% in Libya, with higher rates observed in females and younger students.<sup>[11]</sup>

Despite the high prevalence of infection, there are information gaps and inappropriate practices regarding *H. pylori* worldwide.<sup>[12-15]</sup> These gaps suggest an urgent need for increased primary healthcare and targeted health education, especially in high-prevalence areas, with the aim of ensuring that affected populations receive accurate information that will inform their decisions and prevent harmful practices. Transmission, one of the fundamental problems yet poorly understood, can be through person-to-person contact, frequently early in life, although the specific roles of domestic environments and faecal-oral and oral-oral routes are difficult to quantify owing to the lack of adequate robust epidemiological studies that control

for confounding variables.<sup>[16-18]</sup> There are significant knowledge gaps globally, notably among university students. Failure to address these gaps leads to significant health and economic burdens at the individual, institutional and societal levels.<sup>[19,20]</sup>

As would be expected, discrepancies exist: students in developed countries have higher knowledge percentages (81 - 95.8%), whereas students in developing countries have lower percentages, a difference determined by socioeconomic factors and level of study.<sup>[19,21,22]</sup>

There are persistent gaps in knowledge about transmission, severe effects and treatment of *H. pylori* among non-health science students, leading to delayed care and continued transmission.<sup>[20]</sup> This situation illustrates the pressing need for extensive awareness campaigns in school curricula.<sup>[19,20]</sup>

Previous studies published between 1997 and 2014 worldwide have shown that knowledge about *H. pylori* is poor.<sup>[23]</sup> This challenge is exacerbated in resource-poor, high-prevalence settings such as Sudan. Socioeconomic factors, limited access to healthcare, and individual risk factors such as specific dietary habits, hygiene and overcrowding drive their high infection rates.<sup>[9]</sup> Even medical students in Sudan have gaps in knowledge about infection, and infection is closely associated with lifestyle.<sup>[9]</sup> Similarly high prevalence and knowledge gaps are reported in other high-burden countries such as Ethiopia.<sup>[24]</sup>

General global efforts often neglect Sudan's specific risk factors. We have a pressing need for local research on student awareness in order to create targeted education, enabling this group to reduce infection and improve health.<sup>[9,20]</sup>

Data on *H. pylori* prevalence, knowledge and practice in Sudan, particularly among students in regions such as Nyala, South Darfur, are very limited. Student awareness is of considerable public health importance in that it has immediate implications for education and interventions aimed at this group. Increasing urbanisation, lifestyle change and security concerns in the region complicate health initiatives, and the exploration of this knowledge is critical to the development of effective preventive measures and the encouragement of early detection.

The aim of this study was to assess knowledge and attitudes regarding *H. pylori* infection among students at Darfur University College in Nyala city, South Darfur State, Sudan. The findings will provide baseline information to inform health education campaigns and early detection programmes, ultimately leading to a reduction in *H. pylori*-related disease.

## Methods

### Study setting and design

A descriptive, cross-sectional study was conducted among students aged  $\geq 18$  years at Darfur University College. Data collection took place from March to April 2023.

### Questionnaire and data collection

The study utilised a structured questionnaire adapted from Al Omari *et al.*<sup>[25]</sup> to assess knowledge, attitudes and practices with regard to *H. pylori* infection among college students. To ensure clarity, appropriateness, and cultural relevance for the target population, a pilot study was conducted with a random sample of 30 individuals.

Based on pilot feedback, linguistic and grammatical modifications were made to refine the survey instrument. Data collected during the pilot phase were excluded from the final analysis. The validated and refined Arabic version questionnaire was subsequently distributed to the main study participants. The instrument comprised four sections: sociodemographic characteristics, knowledge about *H. pylori* infection, attitudes to the infection, and questions relating to detection and prevention of *H. pylori* infection.

The principal investigators (authors THM and SIA) trained six graduate medical students in data collection protocols, including how to distribute the questionnaire, seek informed consent, and ensure participant anonymity and confidentiality. The questionnaire was administered to participants via an online survey process, ensuring uniformity and consistency in data collection. Some data were also collected using a printed version of the questionnaire that was distributed to students on campus.

### Study population and sampling

The study population was 2 000 male and female undergraduate students attending Darfur University College, aged 15 - 24 years, selected based on their high vulnerability to exposure to *H. pylori* infection.

The required sample size was determined to be 323 participants. This calculation was performed using an online sample size calculator (<https://www.calculator.net/sample-size-calculator.html>) using a 95% confidence level, a 5% margin of error, and a population proportion of 0.5.

### Inclusion and exclusion criteria

Students were eligible for enrolment if they were studying at Darfur University College and were willing to participate during the study period. Individuals were excluded if they were data collectors, research team members, or had any medical condition that could prevent them from providing complete responses.

### Ethical considerations

This study was approved by the Ethics Committee of Darfur University College in March 2023. All the students provided written informed consent prior to taking part. Participants were assured that their responses would be handled confidentially and anonymously.

### Data analysis

The data collected were imported into the Statistical Package for the Social Sciences (SPSS), version 25.0 for Windows (IBM, USA). The results were presented using descriptive summary measures such as frequencies, tables, and graphs in the form of percentages. Descriptive statistics for describing and summarising the essential characteristics of a data set were provided as frequencies and percentages for categorical data. Continuous data were presented as means (standard deviation). Categorical data were compared using the  $\chi^2$  test or Fisher's exact test (as appropriate) to identify the potential association between study variables. A *p*-value  $< 0.05$  was considered to be statistically significant.

## Results

### Characteristics of the study sample

Table 1 shows the participants' baseline demographic data and characteristics. Of 323 eligible participants who completed the study questionnaire, 138 (42.7%) were male and 185 (57.3%) female.

The mean age of the students was 22.1 years. The overall prevalence of self-reported *H. pylori* infection for students was 40.6%, and that for families was 48.6%. Education level of the head of the household was reported as low by 69 respondents (21.4%) and high by 232 (71.8%). Of the respondents, 279 (86.4%) lived in urban areas, 39 (12.1%) in rural areas, and 5 (1.5%) in internally displaced persons (IDP) camps.

### Characteristics of participants with a previous family and personal history of *H. pylori* infection

Table 2 presents data on participants with a previous family and personal history of *H. pylori* infection. Significant factors associated with *H. pylori* infection were gender, ( $p=0.008$ ), age ( $p=0.028$ ), and education level of the head of the household ( $p=0.024$ ).

### Knowledge about *H. pylori*

With regard to knowledge on *H. pylori* infection, routes of transmission and prevention, the most commonly cited sources of information were personal reading ( $n=142$ ; 44.0%), mass media ( $n=101$ ; 31.3%) and social media ( $n=80$ ; 24.8%). Of the respondents, 219 (67.8%) were of the opinion that low socioeconomic status was a high-risk factor for *H. pylori* infection, while 104 (32.2%) thought that that it was not a risk factor. With regard to stomach ulcers, 41.2% of the respondents stated that ulcers were a cause of weight loss, 16.4% thought that they caused depression, and 15.5% thought that they caused cause of lack of concentration (Table 3).

### General attitudes to *H. pylori* infection

The  $\chi^2$  test revealed significant associations with regard to fields of study of the Darfur University College students and attitudes towards prevention of *H. pylori* infection ( $p<0.01$ ). Of students from the Department of Laboratory Science, 22 (6.8% of the total respondents) focused on ensuring clean water and hygienic handling of food for prevention of infection, while 44 (13.6%) emphasised improving self-hygiene as a preventive measure. This emphasis on specific preventive measures by students in Laboratory Science is likely to be due to their academic background and access to relevant information (Table 4).

### Attitudes to *H. pylori* infection and screening

The students' attitudes to *H. pylori* infection and screening are shown in Table 5. Most participants held positive views: 85.8% believed that *H. pylori* infection could be cured, 89.5% believed that infection could be prevented, and 50.2% had been tested for *H. pylori*. With regard to testing preferences, stool antigen tests were the most generally accepted (36.5%), followed by blood tests. However, 9.0% of respondents were unaware of any available tests.

When participants were asked their reason for not wanting to have an *H. pylori* test, 5.3% reported having no symptoms, 1.5%

**Table 1. Characteristics of the study sample (N=323)**

Variable	n (%)
Gender	
Male	138 (42.7)
Female	185 (57.3)
Residence	
Urban	279 (86.4)
Rural	39 (12.1)
IDP camp	5 (1.5)
Marital status	
Married	36 (11.1)
Single	287 (88.9)
Age (years)	
15 - 19	70 (21.7)
20 - 24	195 (60.4)
25 - 29	47 (14.6)
>30	11 (3.4)
Range	18 - 43
Mean (SD)	22.10 (3.47)
Academic year	
1	115 (35.6)
2	74 (22.9)
3	70 (21.7)
4	64 (19.8)
Education level of head of household	
Low	69 (21.4)
Moderate	22 (6.8)
High	232 (71.8)
<b>Variable</b>	<b>n (%)</b>
Field of study at Darfur University College	
Nursing	58 (18.0)
Medicine	75 (23.2)
Laboratory science	95 (29.4)
Dental	30 (9.3)
Non-health	65 (20.1)
Health insurance	
No insurance	38 (11.8)
Fully covered	81 (25.1)
Partially covered	204 (63.2)
Income of household	
Agriculture/trading service	42 (13.0)
Government	95 (29.4)
Housewife/retired	13 (4.0)
Daily worker	45 (13.9)
Other	128 (39.6)
Knows about <i>Helicobacter pylori</i> infection (a bacterium that causes peptic ulcers)	282 (87.3)
Family history of <i>H. pylori</i> infection	
Yes	157 (48.6)
No	166 (51.4)
Previous self-reported history of <i>H. pylori</i> infection	
Yes	131 (40.6)
No	192 (59.4)
If yes, have you been treated?	97/131 (74.0)

IDP = internally displaced persons; SD = standard deviation.  
\*Except where otherwise indicated.

**Table 2. Characteristics of respondents with and without a self-reported personal or family history of *Helicobacter pylori* infection (N=323)**

Variable	Infection (n=131), n (%)	No infection (n=192), n (%)	Total	p-value
Gender				0.008
Male	44 (13.6)	94 (29.1)	138 (42.7)	
Female	87 (26.9)	98 (30.3)	185 (57.3)	
Age (years)				0.028
15 - 19	20 (6.2)	50 (15.5)	70 (21.7)	
20 - 24	88 (27.2)	107 (33.1)	195 (60.4)	
25 - 29	16 (5.0)	31 (6.9)	47 (14.6)	
>30	7 (5.3)	4 (2.1)	11 (3.4)	
Residence				0.816
Urban	115 (35.6)	164 (50.8)	279 (86.4)	
Rural	14 (4.3)	25 (7.7)	39 (12.1)	
IDP camp	2 (0.6)	3 (0.9)	5 (1.5)	
Education level of head of household				0.024
Low	19 (5.9)	50 (15.5)	69 (21.4)	
Moderate	12 (3.7)	10 (3.1)	22 (6.8)	
High	100 (31.0)	132 (40.9)	232 (71.8)	

IDP = internally displaced persons.

cited lack of knowledge regarding the benefits of the test, and 0.9% were concerned that a diagnosis would pose a psychological burden. With regard to symptoms of *H. pylori* infection, 20.1% believed that symptoms would be severe or had experienced severe symptoms.

In terms of general attitudes to prevention of *H. pylori* infection, improving self-hygiene (42.4%), ensuring clean water and hygienic handling of food (36.5%) and washing one's hands after using the toilet (30.0%) were considered key preventive measures against *H. pylori* infection.

Fig. 1 shows that just over half of the participants used tap water as the primary source of drinking water (n=166; 51.4%), followed by both tap water and bottled water.

Of the participants, 211 (65.3%) stated that the faecal-oral route was the primary mode of transmission of *H. pylori*, 33 (10.2%) reported that it could be transmitted by kissing, and 19 (5.9%) reported that it could be transmitted through inhalation; 60 (18.6%) did not know the mode of transmission (Fig. 2).

Fig. 3 shows traditional methods used to treat *H. pylori* infection. Of the participants, 145 (44.9%) reported that honey was a potential treatment method.

With regard to *H. pylori* prevention, 148 (45.5%) of participants were of the opinion that regular washing of hands before and after meals would prevent *H. pylori* infection, and 118 (36.5%) believed that avoiding drinking untreated water or eating contaminated and unhygienically prepared food would help in preventing the disease (Fig. 4).

## Discussion

*H. pylori* infection is a significant global health issue, affecting over half of the global population in 2015, largely in developing countries. In Sudan, more research is needed to assess current knowledge, attitudes and practices with regard to this infection.<sup>[26]</sup>

Public awareness and attitudes regarding *H. pylori* are of critical importance in formulating prevention and treatment programmes worldwide.<sup>[12,14]</sup> Effective management of the disease is vital, because untreated infections lead to severe complications. The aim of the present study was to assess students' knowledge and attitudes regarding *H. pylori* in Nyala, South Darfur State, Sudan.

In contrast to results documented in southern Ethiopia,<sup>[27]</sup> where rural residence emerged as the most important risk factor, our research showed that there was a fairly high rate of infection among students living in cities (41.2%). This finding could be due to local risk factors in Nyala, such as lack of safe water and poor hygiene.

Most of the participants in the present study (87.3%) were aware that *H. pylori* is a bacterium that causes peptic ulcers. This level of knowledge is higher than in many other studies: 68.7% of participants in Jordan had low knowledge,<sup>[15]</sup> only 47.0% of Chinese participants were aware that *H. pylori* is a risk factor for gastric cancer<sup>[28]</sup> and an extensive cross-sectional study in Sharjah, United Arab Emirates, revealed poor general awareness of *H. pylori*-induced gastric ulcers and cancers.<sup>[29]</sup>

However, the participants in the present study had unclear knowledge of the process of transmission of *H. pylori*. While 65.3% said that the faecal-oral route was the most important, other participants incorrectly suggested that the organism could be spread through kissing and breathing, and 18.6% did not know how it was transmitted. It is accepted that *H. pylori* is transmitted via the faecal-oral route, most commonly in food and water that is contaminated with it.<sup>[30]</sup> Because of this route of transmission, *H. pylori* has been found to have an increased rate of occurrence within certain families.<sup>[30]</sup> Better public knowledge regarding routes of transmission is therefore required to enhance prevention and control strategies.<sup>[15]</sup>

Our participants' tendency to rely on informal sources is consistent with findings of a low rate of knowledge acquisition from

Table 3. Respondents' knowledge about <i>Helicobacter pylori</i> infection (N=323)	
Responses	n (%)
What is <i>H. pylori</i> ?	
Virus parasite	33 (10.2)
Fungi	12 (3.7)
Acid in the stomach	56 (17.3)
Bacteria	188 (58.2)
Don't know	34 (10.5)
In your opinion, is there an association between <i>H. pylori</i> and ulcer?	
Yes	233 (72.2)
No	90 (27.8)
In your opinion, can <i>H. pylori</i> cause cancer?	
Yes	184 (57.0)
No	139 (43.1)
Have you ever been tested for <i>H. pylori</i> ?	
Yes	162 (50.2)
No	161 (49.9)
<i>H. pylori</i> infection can cause <i>H. pylori</i> -related gastritis	
Yes	263 (81.4)
No	60 (18.5)
<i>H. pylori</i> infection can cause malignant tumours	
Yes	148 (45.8)
No	175 (54.1)
Treatment of <i>H. pylori</i> infection can prevent gastric cancer	
Yes	217 (67.2)
No	106 (32.9)
Untreated <i>H. pylori</i> infection may lead to gastric cancer	
Yes	222 (68.7)
No	101 (31.2)
<i>H. pylori</i> infection-related gastritis can cause abdominal pain, abdominal distension, acid reflux, belching, and other symptoms	
Yes	286 (88.5)
No	37 (11.4)
What effect does an ulcer have on the patient?	
Lack of concentration	50 (15.5)
Loss of weight	133 (41.2)
Depression	53 (16.4)
Anxiety	49 (15.2)
Highly irritable	23 (7.1)
Trauma	15 (4.6)
<b>... continued</b>	

Table 3. (continued) Respondents' knowledge about <i>Helicobacter pylori</i> infection (N=323)	
Responses	n (%)
In your opinion, what are the symptoms of stomach ulcer?	
Heartburn	79 (24.5)
Blood in stool	86 (26.6)
Nausea/vomiting	92 (28.5)
Back pain	26 (8.0)
Unexpected weight loss	40 (12.4)
Low socioeconomic status is a risk factor for <i>H. pylori</i> infection	
Correct	219 (67.8)
Incorrect	104 (32.2)
If a person has <i>H. pylori</i> infection, he/she can be treated with tablets	
Correct	284 (87.9)
Incorrect	39 (12.1)
The duration of treatment for <i>H. pylori</i> infection is 1 - 2 weeks	
Correct	204 (63.2)
Incorrect	119 (36.8)
In order to avoid recurrence of <i>H. pylori</i> infection, a person should comply with the treatment plan	
Correct	268 (83.0)
Incorrect	55 (17.0)
If a person has persistent burning pain in the upper abdomen and thinks they may have <i>H. pylori</i> infection, they should seek immediate medical advice	
Correct	253 (78.3)
Incorrect	70 (21.6)
Some people with <i>H. pylori</i> infection do not experience any signs or symptoms	
Correct	214 (66.3)
Incorrect	109 (33.7)
Is gastric cancer a complication of <i>H. pylori</i> infection?	
Yes	224 (69.3)
No	99 (31.1)
Sources of knowledge about <i>H. pylori</i> infection, its routes of transmission and its prevention	
Personal reading	142 (44.0)
Social media	80 (24.8)
Mass media (news, television and radio)	101 (31.3)

traditional sources in Jordan.<sup>[15]</sup> In terms of diagnostic preferences, 36.5% of participants indicated that they would prefer a stool test, while 26.9% would prefer a blood test. This finding indicates positive attitudes to new, non-invasive detection techniques, i.e. detecting antibodies in saliva and urine or antigens in stool.<sup>[31]</sup>

A key finding was that 87.9% of the participants believed that *H. pylori* infection can be treated with antibiotic tablets. However, many indicated that these could be obtained without a medical prescription. Such a practice, already documented in earlier research,<sup>[32]</sup> indicates insufficient knowledge of how to use antibiotics correctly for treating *H. pylori*. It directly contributes to the rising worldwide issue of antibiotic resistance, to the burden of disease, and

to ineffectiveness of standard treatment regimens. Although selling antibiotics without a prescription is prohibited in Sudan, it remains a common phenomenon, as in other countries.<sup>[33-35]</sup> This challenging observation indicates a significant public health issue that requires more research and intervention.

The origin of drinking water was identified as a significant transmission factor in the present study. Over half (51.4%) of the participants drank municipal tap water, which was suspected to have a high transmission effect, and 25.7% drank water other than tap or bottled water or water hand-pumped from wells. Klein *et al.*<sup>[36]</sup> reported that municipal water was one of the primary sources of infection in all socioeconomic strata, while a study in

**Table 4. General attitudes to prevention of *Helicobacter pylori* infection in relation to gender and field of study (N=323)**

Variable	Ensure clean water and hygienic handling of food	Improve self-hygiene	Get frequent check-ups	Avoid sharing utensils	None of these	Total
Gender*						
Male	42 (13.0)	55 (17.0)	28 (8.7)	5 (1.5)	8 (2.5)	138 (42.7)
Female	54 (16.7)	82 (25.4)	24 (7.4)	15 (4.6)	10 (3.1)	185 (57.3)
Total	96 (29.7)	137 (42.4)	52 (16.1)	20 (6.2)	18 (5.6)	
Field of study**						
Nursing	14 (4.3)	21 (6.5)	10 (3.1)	6 (1.9)	7 (2.2)	58 (18.0)
Medicine	16 (5.0)	41 (12.7)	13 (4.0)	4 (1.2)	1 (0.3)	75 (23.2)
Laboratory science	22 (6.8)	44 (13.6)	18 (5.6)	7 (2.2)	4 (1.2)	95 (29.4)
Dental	14 (4.3)	12 (3.7)	3 (0.9)	0	1 (0.3)	30 (9.3)
Non-health	30 (9.3)	19 (5.9)	8 (2.5)	3 (0.9)	5 (1.5)	65 (20.1)
Total	96 (29.7)	137 (42.4)	52 (16.1)	20 (6.2)	18 (5.6)	

\* $\chi^2=12.56; p=0.128$ ; \*\* $\chi^2=32.61; p=0.01$ .

**Table 5. Attitudes to *Helicobacter pylori* infection and screening in the study sample (N=323)**

Responses	n (%)
Do you think <i>H. pylori</i> infection can be cured?	
Yes	277 (85.8)
No	46 (14.3)
Do you think <i>H. pylori</i> infection can be prevented?	
Yes	289 (89.5)
No	34 (10.4)
Have you ever been tested for <i>H. pylori</i> ?	
Yes	162 (50.2)
No	161 (49.9)
Which is your preferred <i>H. pylori</i> test?	
None preferred	27 (8.4)
Urea breath test	29 (9.0)
Stool antigen test	118 (36.5)
Blood test	87 (26.9)
Endoscopic biopsy	21 (6.5)
None acceptable	12 (3.7)
Don't know	29 (9.0)
Would you like to have an <i>H. pylori</i> test?	
Yes	282 (87.3)
No	41 (12.7)
Why do you not want to have an <i>H. pylori</i> test?	
Would have the test/don't know	283 (87.6)
Lack of knowledge regarding the benefits of the test	5 (1.5)
Confirmation of the disease would pose a psychological burden	3 (0.9)

**... continued**

**Table 5. (continued) Attitudes to *Helicobacter pylori* infection and screening in the study sample (N=323)**

Responses	n (%)
Why do you not want to have an <i>H. pylori</i> test? (continued)	
No symptoms	17 (5.3)
Lack of time	5 (1.5)
Financial reason	1 (0.3)
Other	9 (2.8)
General attitudes to prevention of <i>H. pylori</i> infection	
Ensure clean water and hygienic handling of food	118 (36.5)
Improve self-hygiene	137 (42.4)
Get frequent check-ups	52 (16.1)
Avoid sharing utensils	20 (6.2)
None of the above	18 (5.6)
Severity of symptoms of <i>H. pylori</i> infection	
Don't know	176 (54.5)
Mild	29 (9.0)
Moderate	53 (16.4)
Severe	65 (20.1)
Perceptions regarding transmission of <i>H. pylori</i>	
Washing hands after using the toilet protects one from getting infected	97 (30.0)
Washing hands before eating protects from transmission	61 (18.9)
Eating raw vegetables and fruits is linked to transmission	33 (10.2)
Drinking contaminated water may be a source of infection	92 (28.5)
Source of drinking water (well water) is associated with transmission	40 (12.4)

South India showed extremely high infection rates of 74.8% among individuals who drank tap water and 92% among those who drank water from wells.<sup>[37]</sup> Improving household hygiene practices, better waste management, and boiling water that will be used for drinking are therefore vitally important, and should be highly recommended to college students in an attempt to reduce prevalence and transmission. Intervention with regard to water quality and safe

drinking practices is an essential step towards reducing *H. pylori* infection rates in South Darfur State.

To our knowledge, this is the first cross-sectional study to evaluate knowledge and attitudes regarding *H. pylori* infection among students in South Darfur State, namely at Darfur University College in Nyala. Nevertheless, some limitations need to be taken into account when interpreting these results. The study was

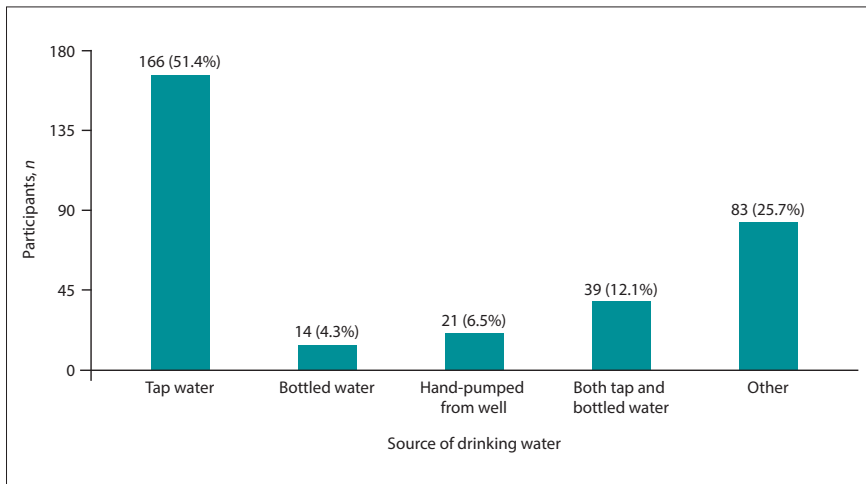


Fig. 1. The main sources of drinking water reported by the study participants (N=323).

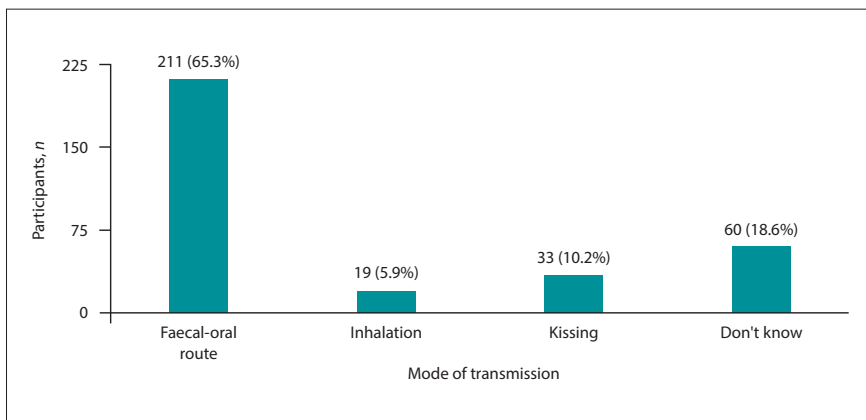


Fig. 2. Perceived modes of transmission of *Helicobacter pylori* (N=323).

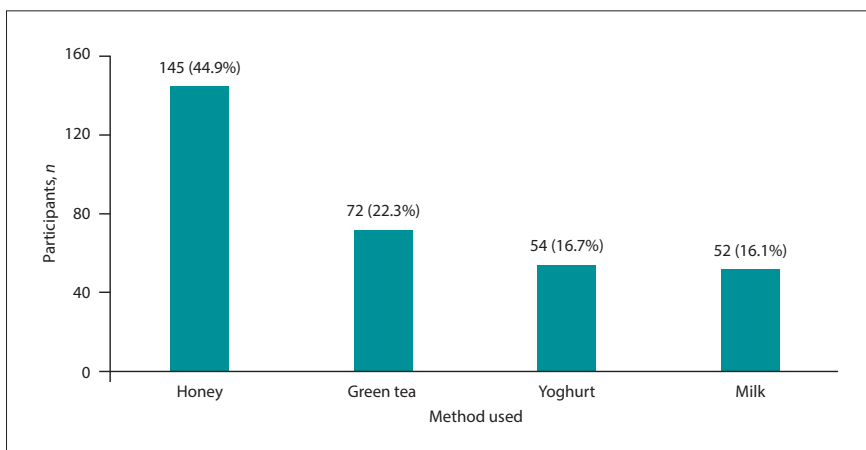


Fig. 3. Traditional methods used for the treatment of *Helicobacter pylori* infection (N=323).

cross-sectional in nature and did not allow for the determination of cause-and-effect relationships among variables. Use of self-report questionnaire data is subject to the risk of social desirability and recall bias, particularly with regard to personal practices. Employing convenience sampling

at a single site also limits the generalisability of results to students in general. Finally, the lack of clinical confirmation of infection means that the reported attitudes and practices are not directly comparable with infection status, which would have strengthened the conclusions. In spite

of these constraints, this study provides helpful initial results that can be used to guide future health policy and educational interventions to promote improved student health outcomes.

## Conclusion

Undergraduates from Darfur University College were aware of published evidence regarding *H. pylori* infection, and most of them were receptive to altering their attitudes based on published evidence. The findings suggest that while traditional treatment is an important consideration, residence in an urban or rural area, or in internally displaced persons (IDP) camps, did not significantly influence this particular aspect of healthcare practice among the participants.

Additionally, participants varying beliefs and levels of understanding among participants regarding preventive measures. The importance of avoidance of untreated water and contaminated and unhygienically prepared food and the importance of regular handwashing are better understood as preventive measures than the practice of using individual eating and drinking utensils.

Further, research is needed to examine these significant demographic variables more closely in order to confirm our findings and assess generalisability within the targeted population. Such research should also aim to establish waterborne transmission, and guide and help guide and inform public health policy through education.

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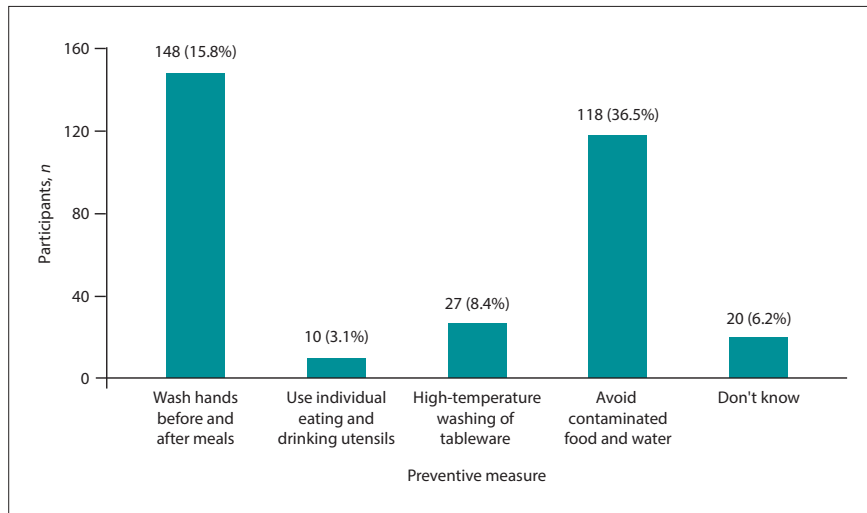


Fig. 4. Preventive measures against *Helicobacter pylori* infection (N=323).

**Data availability statement.** The datasets generated and analysed during the present study are available from the corresponding author (THM) on reasonable request.

**Conflicts of interest.** None.

- Elbehiry A, Marzouk E, Aldubaib M, et al. *Helicobacter pylori* infection: Current status and future prospects on diagnostic, therapeutic and control challenges. *Antibiotics (Basel)* 2023;12(2):191. <https://doi.org/10.3390/antibiotics12020191>
- Salih BA. *Helicobacter pylori* infection in developing countries: The burden for how long? *Saudi J Gastroenterol* 2009;15(3):201-207. <https://doi.org/10.4103/1319-3767.54743>
- Malferrtheiner P, Camargo MC, El-Omar E, et al. *Helicobacter pylori* infection. *Nat Rev Dis Primers* 2023;9(1):19. <https://doi.org/10.1038/s41572-023-00431-8>
- Kusters JG, van Vliet AHM, Kuipers EJ. Pathogenesis of *Helicobacter pylori* infection. *Clin Microbiol Rev* 2006;19(3):449-490. <https://doi.org/10.1128/CMR.00054-05>
- Katellaris P, Hunt R, Bazzoli F, et al. *Helicobacter pylori* World Gastroenterology Organization global guideline. *J Clin Gastroenterol* 2023;57(2):111-126. <https://doi.org/10.1097/MCG.0000000000001719>
- Mbulaiteye SM, Hisada M, El-Omar EM. *Helicobacter pylori* associated global gastric cancer burden. *Front Biosci (Landmark Ed)* 2009;14(4):1490-1504. <https://doi.org/10.2741/3320>
- Aumpan N, Mahachai V, Vilaichone R-K. Management of *Helicobacter pylori* infection. *J Gastroenterol Hepatol* 2023;7(1):3-15. <https://doi.org/10.1002/jgh3.12843>
- Skokowski J, Vashist Y, Girnyi S, et al. The aging stomach: Clinical implications of *H. pylori* infection in older adults – challenges and strategies for improved management. *Int J Mol Sci* 2024;25(23):12826. <https://doi.org/10.3390/ijms252312826>
- Naser NKA, Bashir MBM, Ali ASMA. Prevalence and associated risk factors of *Helicobacter pylori* infection among medical students at Shendi university, Sudan. *BMC Gastroenterol* 2025;466. <https://doi.org/10.1186/s12876-025-04074-9>
- Khaleel AA, Zaki Abdullah SM, Mohammed AB, Anwer SS. Screening for *Helicobacter pylori* IgG among undergraduate student of Hawler Medical University/College of Health Sciences. *Kirkuk J Med Sci* 2020;8(1):123-129. <https://doi.org/10.32894/kjms.2020.169371>

- Almrabet WA, Elazomi A, Araibi E, et al. The prevalence of *Helicobacter pylori* infections and the assessment of some related factors among medical technology students. *Eur J Pharm Med Res* 2019;6(12):529-535.
- Cano-Contreras AD, Rascón O, Amieva-Balmori M, et al. Approach, attitudes, and knowledge of general practitioners in relation to *Helicobacter pylori* is inadequate. There is much room for improvement! *Rev Gastroenterol Mex* 2018;83(1):16-24. <https://doi.org/10.1016/j.rgmx.2017.02.004>
- Alaridah N, Joudeh RM, Jarrar RF, et al. Attitudes and practices regarding *Helicobacter pylori* infection among the public in Jordan: A cross-sectional survey. *Cureus* 2024;16(2):e55018. <https://doi.org/10.7759/cureus.55018>
- Alleft LA, Alhosaini LS, Almutlaq HM, et al. Public knowledge, attitude, and practice toward herpes zoster vaccination in Saudi Arabia. *Cureus* 2023;15(11):e49396. <https://doi.org/10.7759/cureus.49396>
- Alaridah N, Jarrar RF, Joudeh RM, et al. Knowledge and information sources towards *Helicobacter pylori* in Jordan. *PLoS ONE* 2023;18(3):e0278078. <https://doi.org/10.1371/journal.pone.0278078>
- Goodman KJ, Correa P. The transmission of *Helicobacter pylori*: A critical review of the evidence. *Int J Epidemiol* 1995;24(5):875-887. <https://doi.org/10.1093/ije/24.5.875>
- Kayali S, Manfredi M, Gaiani F, et al. *Helicobacter pylori*, transmission routes and recurrence of infection: State of the art. *Acta Biomed* 2018;89(8-5):72-76. <https://doi.org/10.23750/abm.v89i8-5.7947>
- Bui D, Brown HE, Harris RB, Oren E. Serologic evidence for fecal-oral transmission of *Helicobacter pylori*. *Am J Trop Med Hyg* 2016;94(1):82-88. <https://doi.org/10.4269/ajtmh.15-0297>
- Alajmi SM, Alusami TM, Ben Mundayhish MA, et al. Knowledge and attitude of medical students towards *Helicobacter pylori* infection and its prevention and management: A study from Riyadh, Saudi Arabia. *Cureus* 2023;15(12):e51174. <https://doi.org/10.7759/cureus.51174>
- Hafiz TA, D'Sa JL, Zamzam S, Dionaldo MLV, Mubarak MA, Tumala RB. *Helicobacter pylori* infection: Comparison of knowledge between health science and non-health science university students. *Int J Environ Res Public Health* 2021;18(15):8173. <https://doi.org/10.3390/ijerph18158173>
- Zamani M, Ebrahimitabar F, Zamani V, et al. Systematic review with meta-analysis: The worldwide prevalence of *Helicobacter pylori* infection. *Aliment Pharmacol Ther* 2018;47(7):868-876. <https://doi.org/10.1111/apt.14561>

- Padmavathi GV, Nagaraju B, Shampalatha SP, et al. Knowledge and factors influencing on gastritis among distant mode learners of various universities at selected study centers around Bangalore City with a view of providing a pamphlet. *Sch J Appl Med Sci* 2013;1(2):101-110.
- Driscoll LJ, Brown HE, Harris RB, Oren E. Population knowledge, attitude, and practice regarding *Helicobacter pylori* transmission and outcomes: A literature review. *Front Public Health* 2017;5:144. <https://doi.org/10.3389/fpubh.2017.00144>
- Melese A, Genet C, Zeleke B, Andualem T. *Helicobacter pylori* infections in Ethiopia; prevalence and associated factors: A systematic review and meta-analysis. *BMC Gastroenterol* 2019;19(1):8. <https://doi.org/10.1186/s12876-018-0927-3>
- Al Omari SM, Khalifeh AH, Moman R, Sawan HM. Knowledge, attitudes, and practices related to *Helicobacter pylori* and gastric disease in Jordan: Implications for early detection and eradication. *Infect Drug Resist* 2025;18:1503-1514. <https://doi.org/10.2147/IDR.5508330>
- Abbas AA, Sulieman BI, Malik EM. Management of *Helicobacter pylori* among medical doctors working in Khartoum, Sudan 2019: A cross-sectional study. *Afr Health Sci* 2022;22(2):125-134. <https://doi.org/10.4314/ahs.v22i2.15>
- Tadesse E, Daka D, Yemane D, Shimelis T. Seroprevalence of *Helicobacter pylori* infection and its related risk factors in symptomatic patients in southern Ethiopia. *BMC Res Notes* 2014;7:834. <https://doi.org/10.1186/1756-0500-7-834>
- Liu Q, Zeng X, Wang W, et al. Awareness of risk factors and warning symptoms and attitude towards gastric cancer screening among the general public in China: A cross-sectional study. *BMJ Open* 2019;9(7):e029638. <https://doi.org/10.1136/bmjopen-2019-029638>
- Malek AI, Abdelbagi M, Odeh L, Alotaibi AT, Alfardan MH, Barqawi HJ. Knowledge, attitudes and practices of adults in the United Arab Emirates regarding *Helicobacter pylori* induced gastric ulcers and cancers. *Asian Pac J Cancer Prev* 2021;22(5):1645-1652. <https://doi.org/10.31557/APJCP.2021.22.5.1645>
- Brown LM. *Helicobacter pylori*: Epidemiology and routes of transmission. *Epidemiol Rev* 2000;22(2):283-297. <https://doi.org/10.1093/oxfordjournals.epirev.a018040>
- Vaira D, Vakil N. Blood, urine, stool, breath, money, and *Helicobacter pylori*. *Gut* 2001;48(3):287-289. <https://doi.org/10.1136/gut.48.3.287>
- Malferrtheiner P, Megraud F, Rokkas T, et al. Management of *Helicobacter pylori* infection: The Maastricht VI/Florence consensus report. *Gut* 2022;gutjnl-2022-327745. <https://doi.org/10.1136/gutjnl-2022-327745>
- Plachouras D, Kavatha D, Antoniadou A, et al. Dispensing of antibiotics without prescription in Greece, 2008: Another link in the antibiotic resistance chain. *Euro Surveill* 2010;15(7):19488.
- Spellberg B, Powers JH, Brass EP, Miller LG, Edwards JE Jr. Trends in antimicrobial drug development: Implications for the future. *Clin Infect Dis* 2004;38(9):1279-1286. <https://doi.org/10.1086/420937>
- Dameh M, Green J, Norris P. Over-the-counter sales of antibiotics from community pharmacies in Abu Dhabi. *Pharm World Sci* 2010;32(5):643-650. <https://doi.org/10.1007/s11096-010-9418-5>
- Klein PD, Graham DY, Gaillour A, Opekun AR, Smith EO. Water source as risk factor for *Helicobacter pylori* infection in Peruvian children: Gastrointestinal Physiology Working Group. *Lancet* 1991;337(8756):1503-1506. [https://doi.org/10.1016/0140-6736\(91\)93196-g](https://doi.org/10.1016/0140-6736(91)93196-g)
- Ahmed KS, Khan AA, Ahmed I, et al. Impact of household hygiene and water source on the prevalence and transmission of *Helicobacter pylori*: A South Indian perspective. *Singapore Med J* 2007;48(6):543-549.

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