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*Research Article*

# Assessment of Adults' Knowledge, Attitudes, and Practices Regarding Helicobacter Pylori-Induced Gastric Ulcers and Cancers in the Western Region of Saudi Arabia

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## Abstract

**Background:** A gastrointestinal pathogen in humans and the most common bacteria found in the guts of nearly half of people worldwide is Helicobacter pylori (*H. pylori*). It is well recognized that *H. pylori* causes gastric cancer, peptic ulcers, and dyspepsia. This study aims to evaluate the adult population's existing knowledge, attitudes, and practices regarding stomach malignancies and ulcers caused by *H. pylori* in the western region of Saudi Arabia.

**Methods:** This is a descriptive, cross-sectional study based on an electronic Google Forms survey conducted in January-March 2024. The target group of this study was the general adult population with *H. pylori* infection in the western area of Saudi Arabia. The inclusion criteria of this study were the general adult population – both male and female genders, above 18 years of age – in the western region of Saudi Arabia. We excluded those below 18 and those who did not agree to participate in our survey.We included 425 participants, and the sample size was calculated using Epi Info Software. Every participant filled out a consent form, and the university's ethics board granted ethical approval.

**Results:** This study comprised 425 participants from the western region of Saudi Arabia. The ages ranged from 18 to 50 years. We found that general knowledge about *H. pylori*-induced gastric ulcers and cancer is poor; however, knowledge regarding common causes is relatively good. Of the participants, 70.6% knew that H. pylori and stomach ulcers are related, but only 57.4% knew that H. pylori and stomach cancer are related. Additionally, 25.9% believed they may have *H. pylori*, and 38.4% reported having a very low risk of acquiring gastric cancer. Most of the responses demonstrated generally good practices regarding *H. pylori* infections.

**Conclusion:** General knowledge about H. pylori-induced gastric ulcers and cancer is poor. Education about H. pylori and its consequences should be the primary goal of future initiatives and programs, particularly in areas where the infection is most prevalent. However,most of our respondents showed generally good practices toward H. pylori infection.

# INTRODUCTION

Globally, stomach ulcers and gastric cancer cause one million deaths annually (Ferlay et al., 2015)(Plummer et al., 2016) . Non-steroidal anti-inflammatory medicines (NSAIDs) and an infection with Helicobacter pylori are the two main risk factors linked to the devel-

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opment of gastric ulcers (Kuna et al., 2019) . Gram-negative H. pylori bacteria may remain in the stomach mucosa, causing tissue damage and severe inflammation (Hooi et al., 2017) . Nearly half of the global population is thought to be infected with H. pylori, with notable geographical differences (Hooi et al., 2017) . The primary signs and symptoms of an H. pylori infection include heartburn, nausea, vomiting, and abdominal pain and swelling [5] , [6] . Serious consequences like peptic ulcers, which can cause bleeding, can be brought on by H. pylori. In addition to gastric B-cell lymphoma, it can potentially cause stomach adenocarcinoma (Kumar & Clark's Clinical Medicine Nine Edition, 2016) .

It can take decades for H. pylori to cause stomach cancer; the process begins with chronic gastritis, moves through atrophic gastritis, intestinal dysplasia, and ultimately results in cancer (Moss, 2017) . Before any problems manifest, this latency period offers a period of opportunity for an early identification and eradication of H. pylori (Moss, 2017) . H. pylori can be diagnosed using two different methods: a noninvasive method,such as stool antigen testing, 13C-urea breath testing, and serological testing; or an invasive method,such as an endoscopy for biopsy, urease testing, histological analysis, and culture (Rueda-Robles et al., 2021). According to a previous study conducted in the United Arab Emirates, there is a lack of general understanding regarding H. pylori-induced stomach ulcers and cancer (Malek et al., 2021) . Furthermore, the incidence of H. pylori seropositivity among seemingly healthy youngsters (40%) indicates that Saudi Arabia has a substantial number of cases (Wang et al., 2004)(Al-Hussaini et al., 2019) . Furthermore, the incidence of H. pylori seropositivity among seemingly healthy youngsters (40%) indicates that Saudi Arabia has a substantial number of cases (Wang et al., 2004)(Al-Hussaini et al., 2019). Despite this large number, there is no study yet to assess knowledge, attitudes and practices of Saudi adults regarding H. pylori-induced gastric ulcers and cancers. Therefore, the purpose of this study was to evaluate Saudi adults' knowledge, attitudes, and behaviors about stomach ulcers and cancers caused by H. pylori.

# MATERIALS AND METHODS

## Study design and participants:

An electronic Google Forms survey was used to perform this cross-sectional descriptive study. We included the general adult population – both male and female genders, above 18 years of age – in the Western region of Saudi Arabia. We excluded those below 18 and those who did not agree to participate in our survey.

## Sample size and questionnaire:

Our study included a sample size 425 participants in order to enhance the generalizability and representativeness of the findings to the broader population residing in the western region. The Epi Info Software was used to compute the sample size . According to the sample size calculator, this study's minimum recommended sample size was 384, the confidence interval level was 95%, with 5% margin of error, and a response distribution of 50%.

The questionnaire was validated and adapted from a published study (Driscoll et al., 2017) . Then, the survey was distributed in the Arabic language to the targeted population via social media platforms (WhatsApp and Telegram). The questionnaire contains the following sections: The first section covered general demographic information about the participants, such as age, nationality, sex, marital status, city, educational level, and marital status. The second section assessed the participants' knowledge of H. pylori and gastric cancer. The third section assessed the participants' attitudes towards H. pylori and gastric cancer. The fourth section assessed the participants' practice towards H. pylori and gastric cancer. Before starting the questionnaire, consent was acquired from all participants.

## Patient Consent and Ethical Approval

The study was conducted between January 2024 to March 2024. The Biomedical Ethics Committee at Umm Al-Qura University provided ethical approval, College of Medicine, Makkah, KSA, with approval No. HAPO-02-K-012-2023-12-1926.

## Data analysis

Following data collection and evaluation, version 21 of the Statistical Package for Social Sciences (SPSS: an IBM Company) was used to process the data. All statistical methods used were two-tailed with an alpha level of 0.05 and considering significance if the P value was less than or equal to 0.05. The overall awareness level regarding H. pylori and gastric cancer was assessed by summing up various scores for different correct awareness items. If a participant's score was less than 60% of the total score, the overall awareness score was classified as bad, and if it was 60% or more, the overall awareness score was classified as good. Descriptive analysis was conducted by prescribing frequency distribution and percentage for study variables, including participants' personal data, educational level, work data, and family history. Also, participants' knowledge about, attitudes towards, and practices involving H. pylori and gastric cancer were tabulated while their overall knowledge level and reasons for not undergoing screening were graphed. We use cross tabulation to show factors associated with participants' knowledge about H. pylori and gastric cancer and the relationship with their practices using Pearson chi-square test for significance and an exact probability test if there were small frequency distributions.

**Table 1:** Socio-demographic characteristics of study participants, Western region, Saudi Arabia (n=425).

| Socio-demographics | No | % |
|---|---|---|
| Age in years | | |
| 18-25 | 157 | 36.9% |
| 26-30 | 34 | 8.0% |
| 31-40 | 67 | 15.8% |
| 41-50 | 89 | 20.9% |
| >50 | 78 | 18.4% |
| Nationality | | |
| Saudi | 393 | 92.5% |
| Non-Saudi | 32 | 7.5% |
| Gender | | |
| Male | 179 | 42.1% |
| Female | 246 | 57.9% |
| Marital status | | |
| Single | 199 | 46.8% |
| Married | 196 | 46.1% |
| Divorced / widow | 30 | 7.1% |
| Educational degree | | |
| Below secondary | 13 | 3.1% |
| Secondary | 87 | 20.5% |
| Diploma | 45 | 10.6% |
| University / above | 280 | 65.9% |

# RESULTS

A total of 425 participants completed the study survey. Participants' the age range covered the years 18 to 50, with a mean age of 31.9 ± 11.4 years old. A total of 393 (92.5%) were Saudi and 246 (57.9%) were female. As for marital status, 199 (46.8%) were single and 196 (46.1%) were married. A total of 280 (65.9%) had a university level of education or higher and 87 (20.5%) had a secondary level of education (Table 1).

Regarding knowledge about H. pylori and gastric ulcers and cancers (Table 2), 96% of the participants had heard about H. pylori. Considering transmission of H. pylori, 71.8% reported that it is from having unclean food, while only 17.4% knew that people get infected with H. pylori through water sources, and 33.6% said that it usually occurs through oral contact among family members. A total of 46.8% agreed that more than 50% of Saudi adults have H. pylori in their stomach. Only 9.9% reported that an H. pylori infection often disappears spontaneously. As for diseases caused by H. pylori, 70.6% reported stomach ulcers or duodenum, 40.2% gastroenteritis, and 38.8% colitis. The most reported symptoms of H. pylori were abdominal pain (83.5%), maldigestion (54.4%), and constipation (34.1%). Stool and urine analysis (48.5%), endoscopic gastric biopsy (21.9%), and a blood sample (17.6%) were the reported diagnostic methods of H. pylori. Exactly 22.1% said that H. pylori can be treated by drinking yogurt and 63.3% thought that there is an effective treatment for H. pylori. As for what percentage of gastric cancer participants believed to be genetically predetermined, 44.9% reported 0-25%. In addition, when asked what proportion of participants thought lifestyle changes may prevent stomach cancer, 37.4% replied that it could be prevented in 25–50% of cases. Lastly, 32.5% of participants in the study indicated that 51–75% of cases of stomach cancer might have been avoided with routine tests. Exactly 73.6% agreed that eating spicy foods causes ulcers, 73.2% agreed that bacterial infections cause ulcers, and 63.3% agreed that stress causes ulcers.

Table 3. Participants' attitudes and self-perceptions about H. pylori infections. A total of 110 (25.9%) thought that they could be infected with H. pylori. 163 (38.4%) rated their self-risk of developing gastric cancer as very low, 122 (28.7%) as low and 66 (15.6%) as high to very high.

Table 4. Participants' eating habits and practices of H. pylori and gastric cancer. A total of 416 (97.9%) wash their hands after using toilet, 94.4% wash their hands before a meal, 65.4% use their fingers to eat food, 93.4% eat raw vegetables and fruits, and 98.1% wash raw vegetables and fruits before eating. A total of 230 (54.1%) use tap water for drinking. Only 35 (8.2%) receive regular screenings for gastric cancer. The most reported reasons for not undergoing cancer screenings were lack of symptoms (71.5%), being busy (28.5%), lack of information about screenings (20.3%), and financial barriers (12.3%).

Table 5. factors relating to the general awareness of stomach cancer and H. pylori among participants. A total of 42.7% of young-aged participants had an overall good knowledge level versus 19.2% of old-aged group (P.004). Also, 35.4% of female participants had a good knowledge level compared to 27.4% of male participants (P=.048). Good knowledge about H. pylori was

**Table 2:** Knowledge of adults regarding helicobacter pylori induced gastric ulcers and cancers in the Western region of Saudi Arabia.

| Knowledge | No | % | |
|---|---|---|---|
| Heard about H. Pylori? | Yes | 408 | 96.0% |
| | No | 17 | 4.0% |
| What do you think about the transmission of H. Pylori? | Having unclean food | 305 | 71.8% |
| | Bodily fluids from an infected person | 35 | 8.2% |
| | Sharing utensils and chopsticks | 22 | 5.2% |
| | I don't know | 63 | 14.8% |
| More than 50% of Saudi adults have H. Pylori in their stomach? | Yes | 199 | 46.8% |
| | No | 79 | 18.6% |
| | I don't know | 147 | 34.6% |
| Transmission of the bacteria usually occurs by oral contact among family members? | Yes | 143 | 33.6% |
| | No | 147 | 34.6% |
| | I don't know | 135 | 31.8% |
| How does one become infected with H. pylori, in your opinion? | Through water sources | 74 | 17.4% |
| | Not through water sources | 226 | 53.2% |
| | I don't know | 125 | 29.4% |
| H. Pylori infection often disappears suddenly? | Yes | 42 | 9.9% |
| | No | 263 | 61.9% |
| | I don't know | 120 | 28.2% |
| What diseases can be caused by H. Pylori? | Ulcer in the stomach or duodenum | 300 | 70.6% |
| | Colitis | 165 | 38.8% |
| | Gastroenteritis | 171 | 40.2% |
| | None of these | 9 | 2.1% |
| | I don't know | 54 | 12.7% |
| H. pylori-related symptoms? | Abdominal pain | 355 | 83.5% |
| | Maldigestion | 231 | 54.4% |
| | Constipation | 145 | 34.1% |
| | None of these | 8 | 1.9% |
| | I don't know | 31 | 7.3% |
| How can one diagnose H. Pylori? | Endoscopic gastric biopsy | 93 | 21.9% |
| | Stool and urine analysis | 206 | 48.5% |
| | Blood sample | 75 | 17.6% |
| | I don't know | 51 | 12.0% |
| Is it possible to treat H. Pylori by consuming yogurt? | Yes | 94 | 22.1% |
| | No | 137 | 32.2% |
| | I don't know | 194 | 45.6% |
| Is there a successful H. Pylori treatment? | Yes | 269 | 63.3% |
| | No | 27 | 6.4% |
| | I don't know | 129 | 30.4% |
| What percentage of stomach cancer do you believe is inherited? | 0-25% | 191 | 44.9% |
| | 26-50% | 170 | 40.0% |
| | 51-75% | 64 | 15.1% |
| What percentage of stomach cancer cases do you believe can be avoided with a change in lifestyle? | 0-25% | 104 | 24.5% |
| | 26-50% | 159 | 37.4% |
| | 51-75% | 125 | 29.4% |
| | 76-100% | 37 | 8.7% |
| What percentage of stomach cancer cases do you believe can be avoided with routine screening? | 0-25% | 102 | 24.0% |
| | 26-50% | 109 | 25.6% |
| | 51-75% | 138 | 32.5% |
| | 76-100% | 76 | 17.9% |
| Does stress causes ulcers? | Agree | 269 | 63.3% |
| | Disagree | 62 | 14.6% |
| | I don't know | 94 | 22.1% |
| Eating spicy foods causes ulcers | Agree | 313 | 73.6% |
| | Disagree | 48 | 11.3% |
| | I don't know | 64 | 15.1% |
| Bacterial infection causes ulcers | Agree | 311 | 73.2% |
| | Disagree | 19 | 4.5% |
| | I don't know | 95 | 22.4% |

detected among 39.2% of single participants compared to 25% of married respondents (P=.010).

Table 6. Relation between participants' overall knowledge about H. pylori and gastric cancer and their practices. None of the practice items were significantly as-

**Table 3:** Participants attitude and self-perception towards H. Pylori infection.

| Attitude | No | % |
|---|---|---|
| Do you think you could be infected with Helicobacter pylori? | | |
| Yes | 110 | 25.9% |
| No | 156 | 36.7% |
| Not sure | 159 | 37.4% |
| How do you feel about the possibility that you could have stomach cancer? | | |
| Very high | 33 | 7.8% |
| High | 33 | 7.8% |
| Average | 74 | 17.4% |
| Low | 122 | 28.7% |
| Very low | 163 | 38.4% |

**Table 4:** Participants eating habits and practice of H. Pylori and gastric cancer.

| Practice | No | % |
|---|---|---|
| After using the restroom, do you wash your hands? | | |
| Yes | 416 | 97.9% |
| No | 9 | 2.1% |
| Before a meal, do you wash your hands? | | |
| Yes | 401 | 94.4% |
| No | 24 | 5.6% |
| Water source for drinking? | | |
| Well water | 195 | 45.9% |
| Tap water | 230 | 54.1% |
| How frequently do you use the boiling water each day? | | |
| 1-2 times | 210 | 49.4% |
| 3-4 times | 161 | 37.9% |
| 5-6 times | 54 | 12.7% |
| Do you eat with your fingers? | | |
| Yes | 278 | 65.4% |
| No | 147 | 34.6% |
| Do you consume raw fruits and vegetables? | | |
| Yes | 397 | 93.4% |
| No | 28 | 6.6% |
| Before consuming raw fruits and veggies, do you wash them? | | |
| Yes | 417 | 98.1% |
| No | 8 | 1.9% |
| Are you routinely screened for gastric cancer? | | |
| Yes | 35 | 8.2% |
| No | 390 | 91.8% |

sociated with the study participants' overall knowledge level.

# DISCUSSION

Every year, one million people worldwide die from stomach cancer and ulcers (Ferlay et al., 2015 ) , (Plummer et al., 2016) . The purpose of this study was to evaluate the adult Saudi population’s knowledge, attitudes, and practices around gastric ulcers and cancers caused by H. pylori, as well as overall information about H. pylori-induced gastric ulcers and cancers in Saudi Arabia ' s Western region. Less than half of participants showed a strong overall knowledge, while the majority had an inadequate knowledge of the condition. we found a significant association between age, gender, and material status, in our study. Participants aged 18 to 25 years old had better knowledge than other age groups. This is in contrast to a previous study in the United Arab Emirates (UAE ), which reported that there was no significant association between age and level of knowledge (Malek et al., 2021) . As in a prior study conducted in the United Arab Emirates, female participants possessed a greater degree of knowledge than male participants (Malek et al., 2021) . Additionally, our results showed that single participants had higher levels of knowledge than married participants. In this study, there was no significant correlation found between the study participants ' general knowledge level and any of the practice items.

## Knowledge

General knowledge about H. pylori-induced gastric ulcer and cancer is poor among our population. How-

**Table 5:** Factors relating to the general awareness of stomach cancer and H. pylori among participants.

| Factors | Overall knowledge level | | | | p-value |
|---|---|---|---|---|---|
| | Poor | | Good | | |
| | No | % | No | % | |
| Age in years | | | | | .004* |
| 18-25 | 90 | 57.3% | 67 | 42.7% | |
| 26-30 | 24 | 70.6% | 10 | 29.4% | |
| 31-40 | 50 | 74.6% | 17 | 25.4% | |
| 41-50 | 62 | 69.7% | 27 | 30.3% | |
| >50 | 63 | 80.8% | 15 | 19.2% | |
| Nationality | | | | | .277 |
| Saudi | 270 | 68.7% | 123 | 31.3% | |
| Non-Saudi | 19 | 59.4% | 13 | 40.6% | |
| Gender | | | | | .048* |
| Male | 130 | 72.6% | 49 | 27.4% | |
| Female | 159 | 64.6% | 87 | 35.4% | |
| Marital status | | | | | .010* |
| Single | 121 | 60.8% | 78 | 39.2% | |
| Married | 147 | 75.0% | 49 | 25.0% | |
| Divorced / widow | 21 | 70.0% | 9 | 30.0% | |
| Educational degree | | | | | .740^ |
| Below secondary | 10 | 76.9% | 3 | 23.1% | |
| Secondary | 59 | 67.8% | 28 | 32.2% | |
| Diploma | 33 | 73.3% | 12 | 26.7% | |
| University / above | 187 | 66.8% | 93 | 33.2% | |

P: Pearson X2 test ; $Exactprobabilitytest$
* P < 0.05 (significant)

ever, knowledge regarding the common causes of gastric ulcer and cancer is good. More participants (70.6%) in our survey understood the relationship between H. pylori and stomach ulcers than those who understood the association between H. pylori and gastric cancer (57.4%). This indicates a n insufficient understanding of the pathophysiology and causal effects of this bacteria on the stomach mucosa, which ultimately results in gastric cancer (Malek et al., 2021) . About 22–35% of participants in certain studies who were asked if they had heard of H. pylori said ÿes(Xia et al., 2012 ) , (Chen SY et al., 2005) . It was surprising to see that 96% of participants had heard of H. pylori.

Interestingly, more than two-thirds (71%) of our respondents recognized eating from contaminated food and water was a mode of transmission of H. pylori. This is higher than another study conducted in Shanghai, in which only 24% of respondents correctly identified low food preparation and water as the primary sources of transmission (Chen SY et al., 2005) . In another study, less than half of the participants who were asked about the primary means of H. pylori transmission responded that it is through contaminated food or drink (Malek et al., 2021) . This highlights the significance of handwashing and other hygienic measures, which local health departments should encourage in order to prevent pathogenic diseases brought on by bacteria found in water (Wynne et al., 2013) .

On the other hand, many respondents (60%) believed that family history of cancer, bacterial infection and ulcers can cause gastric cancer, and only 28% believed that stress can cause gastric cancer This is compatible with a study done in South Korea, where the majority of participants mentioned stress and stomach ulcers as major risk factors for stomach cancer (Oh et al., 2009) . They believed that consuming fruits and vegetables, eliminating stomach lesions, and reducing stress would have the greatest effect on preventing gastric cancer.

## Attitude

Our findings show that 25.9% of participants believe they may have H. pylori and 38.4% said they had a very low chance of getting stomach cancer. In relation to other studies, the majority of respondents thought their own risk was the ŝameör ĺowerthan that of others their own age and gender, according to a study in Korea (Shin et al., 2013) . Xia et al. discovered that, even though the prevalence of H. pylori was 41% in this community, 86% of individuals did not believe they had the infection (Xia et al., 2012) .

## Practice

Most of our respondents showed generally good practices. In another study, good practices were found in 74.5% of participants (Abebaw et al., 2014) . In general, reduced H. pylori infection was linked to safe food practices, consuming water from an uncontaminated source, and practicing proper hand washing and cleaning before eating or preparing meal and after using the toilet (Driscoll et al., 2017) . This is compatible with a study that found handwashing did not in-

**Table 6:** Relation between participants' overall knowledge about H. Pylori and gastric cancer and their practice.

| Practice | Overall knowledge level | | | | p-value |
|---|---|---|---|---|---|
| | Poor | | Good | | |
| | No | % | No | % | |
| After using the restroom, do you wash your hands? | | | | | .931^ |
| Yes | 283 | 97.9% | 133 | 97.8% | |
| No | 6 | 2.1% | 3 | 2.2% | |
| Before a meal, do you wash your hands? | | | | | .449 |
| Yes | 271 | 93.8% | 130 | 95.6% | |
| No | 18 | 6.2% | 6 | 4.4% | |
| Water source for drinking? | | | | | .243 |
| Well water | 127 | 43.9% | 68 | 50.0% | |
| Tap water | 162 | 56.1% | 68 | 50.0% | |
| How frequently do you use the boiling water each day? | | | | | .483 |
| 1-2 times | 148 | 51.2% | 62 | 45.6% | |
| 3-4 times | 104 | 36.0% | 57 | 41.9% | |
| 5-6 times | 37 | 12.8% | 17 | 12.5% | |
| Do you eat with your fingers? | | | | | .506 |
| Yes | 186 | 64.4% | 92 | 67.6% | |
| No | 103 | 35.6% | 44 | 32.4% | |
| Do you consume raw fruits and vegetables? | | | | | .411 |
| Yes | 268 | 92.7% | 129 | 94.9% | |
| No | 21 | 7.3% | 7 | 5.1% | |
| Before consuming raw fruits and veggies, do you wash them? | | | | | .233^ |
| Yes | 282 | 97.6% | 135 | 99.3% | |
| No | 7 | 2.4% | 1 | .7% | |
| Are you routinely screened for gastric cancer? | | | | | .762 |
| Yes | 23 | 8.0% | 12 | 8.8% | |
| No | 266 | 92.0% | 124 | 91.2% | |

P: Pearson X2 test ⁻ $Exactprobabilitytest$

crease the prevalence of H. pylori (Lee et al., 2012) . In our study, most of our respondents wash and clean their hands after using the toilet and before eating or preparing a meal, and 65% use their fingers to eat. This highlights the need for additional research to clarify the relationship between H. pylori with handwashing and to develop future recommendations about the issue of handwashing.

## Limitations And strength

One of the challenges encountered during this study was the difficulty of obtaining a representative or equivalent sample from all major cities in the Western region. Unfortunately, it was not feasible to achieve this because of limited access to the population and lack of cooperation in distributing the questionnaires. This limitation could potentially introduce a sampling bias and affect the generalizability of the findings to the entire Western population. Convenience sampling was employed, although using a self-administered questionnaire or in-person data collection would have increased the response rates and lowered the possibility of participation bias. The presence of a selection bias in this study may have an impact on the generalizability of the findings. Convenience sampling may not fully represent the diversity and features of the total population of the Western region of Saudi Arabia. The use of online or remote surveys may have restricted the creation of personal connections with participants, perhaps affecting their level of engagement and quality of their responses. Interestingly, a substantial number of responses were successfully obtained using the online data collection method. To the best of our knowledge, there are no recorded data available regarding the knowledge, attitudes, and practices of adults in Saudi Arabia or the Western region regarding, specifically, and H. pylori-induced gastric ulcers and cancers. Consequently, our study fills a significant gap in the literature and provides valuable insights, since we evaluated participants' knowledge, attitudes, and practices related to H. pylori-induced gastric ulcers and cancer. By examining multiple dimensions, this study provides a holistic understanding of the topic and its importance for the target population.

## CONCLUSION AND RECOMMENDATION

The overall knowledge level about H. pylori-induced gastric ulcers and cancers in the Western region of Saudi Arabia was low. 68% of participants had poor knowledge, which could be treated by conducting regular educational campaigns at hospitals and primary care clinics, malls, or public venues to increase knowledge about H. pylori transmission and its complications. Additionally, healthcare providers should be encouraged to counsel their patients on proper behaviours related to H. pylori transmission and complications, such as gastric ulcers and cancer. We suggest future researchers exclude participants from the medical field to achieve a more comprehensive understanding of knowledge, attitudes, and practices. The inclusion of medical professionals as participants may have introduced confounding factors and influenced the study's findings.

## AUTHOR CONTRIBUTION

The authors participated equally in each step of the research process.

## PARTICIPANT CONSENT AND ETHICAL APPROVAL (IRB)

Before starting the questionnaire, consent was acquired from all participants. The Biomedical Ethics Committee at Umm Al-Qura University provided ethical approval, College of Medicine, Makkah, KSA, with approval No. HAPO-02-K-012-2023-12-1926.

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## DECLARATIONS

**Conflict of interest**: The authors have no relevant financial or non-financial interests to disclose. The authors declare no conflict of interest.



## REFERENCES

Abebaw, W., Kibret, M., & Abera, B. (2014). Prevalence and risk factors of H. pylori from dyspeptic patients in Northwest Ethiopia: A hospital based cross-sectional study. *Asian Pacific Journal of Cancer Prevention*, *15*(11), 4459–4463. https://doi.org/10.7314/APJCP.2014.15.11.4459

Al-Hussaini, A., Al Jurayyan, A., Bashir, S., & Alshahrani, D. (2019). Where are we today with Helicobacter pylori infection among healthy children in Saudi Arabia? *Saudi Journal of Gastroenterology*, *25*(5), 309–318. https://doi.org/10.4103/sjg.SJG_531_18

Chen SY, Liu TS, Fan XM, Dong L, Fang GT, Tu CT, Gu XY, W. J. (n.d.). *Epidemiological study of Helicobacter pylori infection and its risk factors in Shanghai*.

Driscoll, L. J., Brown, H. E., Harris, R. B., & Oren, E. (2017). Population knowledge, attitude, and practice regarding Helicobacter pylori transmission and outcomes: A literature review. *Frontiers in Public Health*, *5*(JUN). https://doi.org/10.3389/fpubh.2017.00144

Ferlay, J., Soerjomataram, I., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., Parkin, D. M., Forman, D., & Bray, F. (2015). Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. *International Journal of Cancer*, *136*(5), E359–E386. https://doi.org/10.1002/ijc.29210

Helicobacter Pylori. (2015). *Archives of Disease in Childhood*, *84*(6), 525.

Hooi, J. K. Y., Lai, W. Y., Ng, W. K., Suen, M. M. Y., Underwood, F. E., Tanyingoh, D., Malfertheiner, P., Graham, D. Y., Wong, V. W. S., Wu, J. C. Y., Chan, F. K. L., Sung, J. J. Y., Kaplan, G. G., & Ng, S. C. (2017). Global Prevalence of Helicobacter pylori Infection: Systematic Review and Meta-Analysis. *Gastroenterology*, *153*(2), 420–429. https://doi.org/10.1053/j.gastro.2017.04.022

Khamisi Said, M. (n.d.). *Prevalence of Helicobacter Pylori Infection Among Patients With Peptic Ulcers and The Associated Risk Factors in Mbagathi Level V Hospital, Nairobi County, Kenya*.

*Kumar & clark's Clinical Medicine nine edition*. (2016). 4043.

Kuna, L., Jakab, J., Smolic, R., Raguz-Lucic, N., Vcev, A., & Smolic, M. (2019). Peptic ulcer disease: A brief review of conventional therapy and herbal treatment options. *Journal of Clinical Medicine*, *8*(2). https://doi.org/10.3390/jcm8020179

Lee, Y. Y., Ismail, A. W., Mustaffa, N., Musa, K. I., Majid, N. A., Choo, K. E., Mahendra Raj, S., Derakhshan, M. H., Malaty, H. M., & Graham, D. Y. (2012). Sociocultural and Dietary Practices Among Malay Subjects in the North-Eastern Region of Peninsular Malaysia: A Region of Low Prevalence of Helicobacter pylori Infection. *Helicobacter*, *17*(1), 54–61. https://doi.org/10.1111/j.1523-5378.2011.00917.x

Malek, A. I., Abdelbagi, M., Odeh, L., Alotaibi, A. T., Alfardan, M. H., & Barqawi, H. J. (2021). Knowledge, Attitudes and Practices of Adults in the United Arab Emirates Regarding Helicobacter pylori induced Gastric Ulcers and Cancers. *Asian Pacific Journal of Cancer Prevention*, *22*(5), 1645–1652. https://doi.org/10.31557/APJCP.2021.22.5.1645

Moss, S. F. (2017). The Clinical Evidence Linking Helicobacter pylori to Gastric Cancer. *Cmgh*, *3*(2), 183–191. https://doi.org/10.1016/j.jcmgh.2016.12.001

Oh, D.-Y., Choi, K. S., Shin, H.-R., & Bang, Y.-J. (2009). Public Awareness of Gastric Cancer Risk Factors and Disease Screening in a High Risk Region: A Population-Based Study. *Cancer Research and Treatment*, *41*(2), 59. https://doi.org/10.4143/crt.2009.41.2.59

Plummer, M., de Martel, C., Vignat, J., Ferlay, J., Bray, F., & Franceschi, S. (2016). Global burden of cancers attributable to infections in 2012: a synthetic analysis. *The Lancet Global Health*, *4*(9), e609–e616. https://doi.org/10.1016/S2214-109X(16)30143-7

Rueda-Robles, A., Rubio-Tomás, T., Plaza-Diaz, J., & Álvarez-Mercado, A. I. (2021). Impact of dietary patterns on h. Pylori infection and the modulation of microbiota to counteract its effect. a narrative review. *Pathogens*, *10*(7). https://doi.org/10.3390/pathogens10070875

Shin, D. W., Cho, J., Kim, S. H., Kim, Y. J., Choi, H. C., Son, K. Y., Park, S. M., Park, J. H., Park, M. S., & Cho, B. (2013). Preferences for the "screen and treat" Strategy of Helicobacter pylori to prevent gastric cancer in healthy Korean populations. *Helicobacter*, *18*(4), 262–269. https://doi.org/10.1111/hel.12039

Wang, K. Y., Li, S. N., Liu, C. S., Perng, D. S., Su, Y. C., Wu, D. C., Jan, C. M., Lai, C. H., Wang, T. N., & Wang, W. M. (2004). Effects of ingesting Lactobacillus- and Bifidobacterium-containing yogurt in subjects with colonized Helicobacter pylori. *American Journal of Clinical Nutrition*, *80*(3), 737–741. https://doi.org/10.1093/ajcn/80.3.737

Wynne, A., Hastings, E. V, Colquhoun, A., Chang, H., Goodman, K. J., & Canhelp, T. (2013). *Untreated water and Helicobacter pylori: perceptions and behaviors in a Northern Canadian community*. *January*.

Xia, P., Ma, M. F., & Wang, W. (2012). Status of Helicobacter pylori infection among migrant workers in Shijiazhuang, China. *Asian Pacific Journal of Cancer Prevention*, *13*(4), 1167–1170. https://doi.org/10.7314/APJCP.2012.13.4.1167