

# Milestones of Knowledge Attitude and Practice among Saudi Population at Risk towards *Helicobacter pylori* Infection

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*H. pylori* infection implicated in the pathogenesis of chronic gastritis, peptic ulcer, and gastric cancer. Moreover, little is understood about possible populations' knowledge, attitudes, and behavior related to *H. pylori*. The present study aimed to assess awareness of the Saudi population towards *H. pylori*. A total of 1324 subjects enrolled, through a well-designed questionnaire that was administered online (through Google online survey). The answers were graded on three-level responses. SPSS software was used for statistical data analysis. The frequency of *H. pylori* was 613 (45.6%) of participants, as well as 453 (74%) of respondents, were female that former infected with *H. pylori*, statistically significant (P-value = 0.052). About (80.1%) of respondents had known *H. pylori*, nevertheless, 85.7% agree that *H. pylori* infection often disappears spontaneously, and (51.2%) didn't know that *H. pylori* can transmit between family members and (28.2%) were neutral. Fortunately, (83.2%) of subjects were aware of HP symptoms, all correlations were statistically significant. (72%) lack of knowledge regarding HP is associated with nutritional factors, food allergies and food intolerance (71.4%) didn't know that washing hands after using the toilet have a negative association with HP. The Saudi population has a high prevalence of *H. pylori*, it is well evident that there is confined knowledge about *H. pylori* among the public, mostly concerning the transmission and its correlation with gastric cancer. General population education must be implemented to increase population awareness towards *H. pylori*, especially among at-high risk populations.

**Keywords:** Awareness; *H. pylori*; The Population at Risk; KAP.

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*Helicobacter pylori* gained global health concern as it is a ubiquitous organism that presently affects approximately one-half of the world's population and leads to chronic gastritis, as it is the most frequent chronic inflammation worldwide. In contrast, up to 85% of people infected with *H. pylori* are symptomless and have no health problems<sup>1,2</sup>.

It is a spiral gram-negative bacterium that colonizes and grows in human gastric epithelial

tissue and mucous membrane. Their presence usually go unnoticed, however, it is associated with gastritis, dyspepsia, nausea, and loss of appetite; it is also involved in the development of other comorbidities such as gastric and duodenal ulcers, in addition to gastric cancer. As it is accounting for roughly 89 percent of all gastric carcinomas, elimination of this infection was shown to minimize the incidence of gastric malignancies<sup>3,4</sup>. There are various laboratory techniques such as can be used

to identify *H. pylori*<sup>5,6</sup> furthermore, all diagnostic procedures serve several functions and have limited applicability.<sup>7</sup>

Precise incidence varies considerably by country, but the developing countries world has a much relatively high disease burden than that of the industrialized world. In Saudi Arabia, *H. pylori* infection is considered to be hyper-endemic. Several other research findings on *H. pylori* in Saudi Arabia have revealed a high prevalence in patients of different ages<sup>8</sup>.

It is noticeable that the infection with *Helicobacter pylori* has increased in Saudi Arabia, and vary considerably among populations, which may be due to the lack of awareness among the population and associated risk factor about the possible ways of transmission and its symptoms, in addition to dangerous complications such as stomach ulcers and stomach cancer<sup>9,10</sup>. Hence low socioeconomic status has indeed been correlated with increased occurrence of *H. pylori* pathogens globally. The socioeconomic status of a subject throughout early life, in particular, is believed to be a substantial criterion of the implementation of *H. pylori* infection. Socio-economic background, on the other hand, is a large and diverse characteristic that includes elements such as hygienic practices, sanitary conditions, urbanization, and access to higher education, most of which have been mentioned to affect the outcome of infection within a community. So in the present study, we attempted to assess the awareness towards *H. pylori* among the Saudi population through the Knowledge, Attitude, and Practice (KAP) survey.

## METHODS

### Design of study

A descriptive cross-sectional KAP survey was conducted in April 2019 on the Public population part of them were previously diagnosed as *H. pylori* patients and suffering from gastritis, and others were never infected to assess and evaluate the milestones of their Knowledge Attitude and Practice of Saudi population towards *H. pylori*. Approval was obtained from the faculty Applied Medical Sciences, and informed consent was also taken from the recruited subjects. Verbal participants' informed consent in compliance

with the Helsinki Declaration was taken from participants before starting the study

### Sample size and Sampling Technique

A total of 1324 subjects enrolled by non-probability sampling technique namely convenience sampling method after satisfied the study inclusion criterion (all Saudi participants, both gender, their age between 20-50 years old).

A well-constructed questionnaire was designed and then administered online (through Google online survey and distributed via E. mails, and WhatsApp groups) to selected populations. A domain to estimate knowledge, attitudes, and practices (KAPs) was set up on the World Health Organization directory to estimate Knowledge, Attitude, and Practice Surveys<sup>11</sup>. For perfection before administration of the questionnaire, a pilot study and validation of questions were done by professionals selected peers.

The survey was available online from 4<sup>th</sup> of April to 4<sup>th</sup> of June 2019, it consists of 21 Closed-ended questions altogether in the following items which are divided into four categories as follows: I) Baseline data and demographic data (age, gender, etc..). II) Knowledge questions (4 III) Attitude question. IV) Practice questions. The answers were graded on three-level responses: agree, disagree, and neutral). However a survey is in the English language, we applied a novel Arabic translated modified version to participants.

### Statistical analysis

The obtained results, along with all demographic information, were analyzed using the SPSS (version 26) program. P-value  $e^{>0.05}$  was considered the level of significance.

### Ethical Approval

The proposal was approved by the department of medical laboratory sciences at the faculty of applied medical science, Prince Sattam Bin Abdul-Aziz University.

## RESULTS

A total of 1342 subjects participated in an online survey to assess awareness of the Saudi population towards *H. pylori*. Table 1 provides a frequency of baseline, demographic data, and respondents characteristics of the study including age, gender, education level, and history of

infection with *H. pylori*. The majority of subjects were females 888 (66.2%), their age ranged from 20 to 50 years old, and half of the 671(50 %) were in age group (31-40 years old), and most of the participants from the rural areas (54.5%), and were primary/ secondary educated (36.4%, and 37.4%) respectively, and (49%) of formerly infected were secondary educate, the result is insignificant (P value=0.436). The frequency of *H. pylori* was 613 (45.6%) of participants, as well as 453 (74%) of respondents, were female that was formerly infected with *H. pylori*, statistically significant (P-value =0.052). (57.1%) of respondents were previously infected in the age group 31-40 years old (P-valued=0.003).

Table 2 displays the frequency of population awareness based on knowledge, with regard knowledge questions (80.1%) of respondents had heard about *H. pylori*, nevertheless, 85.7% agree that HP infection often disappears spontaneously, and (51.2%) didn't know that *H. pylori* can transmit between family members and (28.2%) were neutral. Fortunately, (83.2%) of subjects were aware of HP symptoms, findings were statistically significant.

Four questions regarding attitude summarized in table 3, (79.5%) have had an attitude that *H. pylori* are affecting gender with equal propriety and (72%) lack of knowledge

regarding HP is associated with nutritional factors, food allergies, and food intolerance. Only (49.4%) agreed that untreated infected patients may develop into stomach cancer.

With regard practice questions, (71.4%) didn't know that washing hands after using the toilet has a negative association with HP. While (67.7%) know washing hands before eating protects from HP. While only (48.4%) of participants know that eating raw vegetables and fruits is linked positively with the transmission of infection and (19.3%) answered no and (32.3%) answer not know. Drinking contaminated water may be a source of infection (75.9%) was agreed, however only (29.9%) of participants know that the source of contaminated drinking water (Well water) has a positive association with HP. Findings were statistically significant.

## DISCUSSION

The present study evaluated the knowledge, attitude, and practice of *H. pylori* for perhaps the first study in Saudi Arabia to demonstrate the KAP study and associated risk factors associated with *H. pylori*. The prevalence of *H. pylori* infection was defined according to the different demographic data of the patients, including gender, age. The overall prevalence of

**Table 1.** Baseline Data of Study Participants

Parameters	Total n=1342(%)	Former infected with <i>H. pylori</i> n=613 (%)	Never infected with <i>H. pylori</i> n= 729 (%)	P. value
Gender				
- Male	454 (33.8%)	160 (26%)	294 (40%)	0.052
- Female	888 (66.2%)	453 (74%)	435 (60%)	
Age				
- 20-30 Years old	137 (10.2%)	127 (20.7%)	10 (1.4%)	0.003
- 31- 40 Years old	671 (50%)	350 (57.1%)	321 (44%)	
- 41- 50 Years old	534 (39.8)	136 (22.2%)	398 (54.6%)	
Residence				
- Town	610 (45.5%)	206 (33.6%)	404 (55.4%)	0.046
- Village	732 (54.5%)	407 (66.4%)	325 (44.6%)	
Educational Level				
- Illiterate	151 (11.3%)	93 (15%)	58 (8%)	0.436
- Primary	489 (36.4%)	298 (49%)	191 (26%)	
- Secondary	502 (37.4%)	199 (32%)	303 (42%)	
- University and above	200 (14.9%)	23 (4%)	177 (24%)	

**Table 2.** Population perceptions towards Knowledge questions

No	Questions	Agree	Disagree	Neutral	Mean ±SD	P. value
1	Do you know stomach germ ( <i>H. pylori</i> )	(1073)80.1%	(226)16.8%	(43)3.1%	447.3±113.5	0.010
2	Infection can be orally transmitted among family member	(255) 19 %	(687)51.2%	(400)29.8%	437.3±41.3	0.002
3	HP infection often disappears spontaneously	(1150)85.7%	(75)5.6%	(117) 8.7%	447.3±45.7	0.002
4	HP is known to cause gastric cancer	(576) 42.9%	(192)14.3%	(574)42.7%	447.3±45.67	0.050
5	HP cause nausea, pain, and discomfort in the upper abdomen	(1117)83.2%	(51)3.7%	(174)13%	447±120.4	0.001
6	HP can cause gastric or duodenal ulcer	(875)65.2%	(17)1.2%	(450)33.5%	447.3±88.6	0.030
7	HP can be diagnosed through the endoscopy	(833) 62.1%	(208)15.5%	(301)22.4%	447.3±69.6	0.050
8	Genetic predisposition may be a major cause of injury	(291)21.7%	(558)41.6%	(491)36.6%	446.7±28.7	0.001

**Table 3.** Population perceptions towards attitude questions

Questions	Agree	Disagree	Neutral	Mean ±SD	P. value
1 Affecting both men and women	(1066)79.5%	(58)4.3%	(216)16.1%	446.7 ±112.2	0.001
2 HP is associated with nutritional factors, food allergies, and food intolerance	(966)72%	(158)11.8%	(218)16.1%	447.3 ±92.9	0.003
3 HP gastric cancer risk understanding compared to non-infected people of the same age and gender.	(659)49.1%	(158)11.8%	(525)39.1%	447.3 ± 53.5	0.075
4 HP Gastrointestinal symptoms affect the quality of life	(192)14.3%	(1025)76.4%	(125)9.3%	447.3 ± 103.6	0.002

Table 4. Population Perceptions Towards Practice Questions

Questions	Agree	Disagree	Neutral	Mean $\pm$ SD	P. value
1 Washing hands after using the toilet protects from getting infected with HP	(958)71.4%	(109)8.1%	(275)20.5%	447.7 $\pm$ 92.9	0.002
2 Washing hands before eating protect from HP	(909)67.7%	(208)15.5%	(225)16.8%	447.3 $\pm$ 82.6	0.003
3 Eating raw vegetables and fruits is linked to a Positive relationship with the transmission	(650)48.4%	(259)19.3%	(433)32.3%	447.3 $\pm$ 40.6	0.005
4 Drinking contaminated water may be a source of infection	(1019)75.9%	(67)4.9%	(256)19.1%	447.3 $\pm$ 104.1	0.001
5 Source of drinking water (Well water) have a positive association with HP	(401)29.9%	(659)49.1%	(282)21%	447.3 $\pm$ 39.8	0.054

*H. pylori* among the participants was (45.6%), which is consistent with a previously mentioned study that revealed a prevalence of 54.9% among Saudi patients with dyspepsia in the Jazan region of Saudi Arabia in 2004<sup>12</sup>. A recent study on Saudi patients in 2018 conclude prevalence rates of 46.5%<sup>13</sup>, moreover, about 60% of Hispanics, 54% of African Americans, and about 20 to 29% of White Americans have detectable organisms. These variations in prevalence rates of *H. pylori* in different studies across the world might be attributed to different contributing factors including socioeconomic status, ethnicity, and geographical location also the sensitivity of laboratory techniques used for diagnosis. The significantly highest frequency of *H. pylori* infection in the present study (52.2%) was revealed in the age group between 31-40 years, which is similar to many studies that stated the high-frequency rate of *H. pylori* infection in middle age<sup>14,15</sup>. In contrast, other studies have demonstrated a positive correlation between *H. pylori* prevalence rates and an increase in age (31-40 and more than 40)<sup>16</sup>.

Regarding gender, our findings indicated that 66.2 % of females were infected and (74%) were formerly diagnosed as positive for *H. pylori*, there was statistically significant differences in the prevalence (p-value 0.003) of *H. pylori* between males and females, the crucial role of gender-associated *H. pylori* infection is not fully understood. This finding is in agreement with a study that reported a high prevalence of *H. pylori* among females<sup>12</sup>. However, it conflicts with other authors who noted a high rate of *H. pylori* infection among males, a large number of studies showed no gender differences<sup>17,18,19</sup>.

Residing in a rural area is considered to be a major risk factor for *H. pylori* distribution, among studied subject we revealed significantly high frequency (66.4%) of infected persons were from rural areas, which is the same finding documented by Tadesse, E., Daka et al<sup>20</sup>. The justification of this observation may be due to several discrepancies between rural and urban areas, particularly in terms of person's activities, eating habits, agricultural nature of villages, and source of drinking water. Drinking raw sheep dairy is also much more widespread among rural dwellers than those of city dwellers. In addition to the relatively high frequency (49%) of previously infected, *H. pylori*

were have had a low level of education and less knowledge about prevention and control. The greater academic level was strongly correlated with a faint but not statistically significant decline with *H. pylori* infection, which could be clarified by their different occupations; concluded by Zhu Y *et al*<sup>21</sup>.

### Knowledge

Concerning Knowledge towards *H. pylori*, according to findings participants appears to have limited knowledge about *H. pylori*, because (80%) of respondents react with agreeing when we ask do they know HP, but (51.2%) didn't know that it can be orally transmitted between family members, and only (49%) hadn't known HP infected patients can develop gastric cancer. Surprisingly, the correlation between *H. pylori* and ulcers would be more well-known than the link between *H. pylori* and gastric cancer, this is in line with Shin DW's opinion [22], and Chen SY *et al*<sup>23</sup>. Indeed the current level of knowledge, behaviors, and risk perception in the present population is fake and unauthenticated. Unless knowledge about *H. pylori* transmission was significantly pauper and inadequate, however, we can say overall knowledge was relatively good, because (83.2%) was agree and aware about symptoms, (62.2%) declare that HP diagnosis through endoscopy, and (85.7%) implemented the need for treatment with an antibiotic. Our result is in agreement with Shin DW<sup>22</sup>

### Attitudes

Regarding attitude questions about (79.5%) know that *H. pylori* infect both men and women in equal proportions. found that most people viewed their own risk for developing gastric cancer as average or low<sup>24</sup>. The majority of participants (76.7%) mistakenly believed that HP Gastric symptoms haven't an impact on their quality of life. Additionally (72%) have had a misconception that HP is associated with nutritional factors, food allergies, and food intolerance. Only a few studies studied attitudes towards *H. pylori*, Shin *et al*<sup>22</sup> who identified that almost all respondents viewed their own risk as "identical" or "reduced" when compared with people their age and gender. While according to Oh *et al*<sup>25</sup>, the majority of people believe everyone's risk of having stomach cancer is moderate or negligible.

### Practices

In general, better hand hygiene after

using the toilet and then before eating/preparing a meal, proper food practices, and basic sanitation from a clean source were related to decreased *H. pylori* infection. Present findings revealed that 71.4% of the Saudi population agreed that hand hygiene before and after meals correlate with diminish incidence of *H. pylori* in the community. Fortunately only (48.4%) agreed with eating raw vegetables and fruits linked to the Positive relationship with the transmission, and reminder 19.3%, 32.3% disagreed and were neutral respectively. Interestingly, Abebaw *et al*<sup>26</sup> revealed hand hygiene before eating was correlated with the increased prevalence of *H. pylori*, and cleaning them after the toilet had no impact on *H. pylori* incidence rate. However, such an outcome, contradicts what is commonly believed about this association, like hand washing "mostly not" after toilet and "not always" before meals were correlated with elevated *H. pylori* occurrence<sup>27</sup>.

A frustrating conception revealed from our studied population can lead to negligence *H. pylori* infection as it is considered a class I human carcinogen, that is linked to the development of gastric carcinomas, and gastric cancer is one of the murderous cancers in KSA, with an increasing incidence during the last years.

### Prospective

More cohort researches with large samples size to perfectly determining both bacterial identity and antibiotic resistance profile is contraindicated. Any variables that were not estimated in the current study (such as smoking, eating behavior, lifestyle, and occupation), will be the focus of posterior studies of such populations. With this foresight, health authorities and patient-centered techniques such as assessment, surveillance, and prevention and awareness programs can indeed be optimized to measure gastric cancer triggered by *H. pylori* infection in these high-risk subpopulations.

## CONCLUSION

The current study concludes that *H. pylori* is prevalent in the Saudi population. It is well evident that there is confined knowledge about *H. pylori* among the public, mostly about transmission and its correlation with gastric cancer. General population education must be implemented to

increase population awareness towards *H. pylori*, especially among at-risk populations.

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#### Conflict of interest

The author declares that has no conflict interests.

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#### REFERENCES

- Cover TL, Blaser MJ. Helicobacter pylori in health and disease. *Gastroenterology*; **136**(6):1863-73 (2009).
- Bytzer P, Dahlerup JF, Eriksen JR, Jarbl DE, Rosenstock S, Wildt S. Diagnosis and treatment of Helicobacter pylori infection. *Dan Med Bull*. **58**(4):C4271 (2011).
- Yeh J.M., Kuntz K.M., Ezzati M., Goldie S.J. Exploring the cost-effectiveness of Helicobacter pylori screening to prevent gastric cancer in China in anticipation of clinical trial results. *Int. J. Cancer*; **124**: 157–166 (2009).
- Burucoa C., Delchier J.C., Courillon-Mallet A., de Korwin J.D., Megraud F., Zerbib F., Raymond J., Fauchere J.L. Comparative evaluation of 29 commercial Helicobacter pylori serological kits. *Helicobacter*; **18**:169–179 (2013).
- Vaira D, Vakil N. Blood, urine, stool, breath, money, and Helicobacter pylori. *Gut*; **48**(3):287-289 (2001).
- Takenaka R., Okada H., Kato J., Makidono C., Hori S., Kawahara Y., Miyoshi M., Yumoto E., Imagawa A., Toyokawa T., et al. Helicobacter pylori eradication reduced the incidence of gastric cancer, especially of the intestinal type. *Aliment. Pharmacol. Ther*; **25**: 805–812 (2007).
- Khoder G, Muhammad JS, Mahmoud I, Soliman SSM, Burucoa C. Prevalence of *Helicobacter pylori* and Its Associated Factors among Healthy Asymptomatic Residents in the United Arab Emirates. *Pathogens*; **8**(2):44 (2019).
- Al-Akwaa AM. Prevalence of Helicobacter pylori infection in a group of morbidly obese Saudi patients undergoing bariatric surgery: A preliminary report. *Saudi J Gastroenterol*; **16**:264–7 (2010).
- Al-Hussaini AA, Al Jurayyan AN, Bashir SM, Alshahrani D. Where are we today with *Helicobacter pylori* infection among healthy children in Saudi Arabia?. *Saudi J Gastroenterol*; **25**:309-18 (2019).
- Pelayo Correa, M. Blanca Piazuolo, Natural history of *helicobacter pylori* infection. *Dig Liver Dis*; **40**(7): 490–496 (2008).
- World Health Organization. *A Guide to Developing Knowledge, Attitude and Practice Surveys*. Switzerland: WHO (2008). Available from: [http://apps.who.int/iris/bitstream/10665/43790/1/9789241596176\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/43790/1/9789241596176_eng.pdf)
- Alazmi WM, Siddique I, Alateeqi N, Al-Nakib B. Prevalence of *Helicobacter pylori* infection among Kuwaiti patients with dyspepsia. *BMC Gastroenterol*; **10**: 14 (2010).
- Ramis IB, Vianna JS, Silva Junior LV, Von Groll A, Silva PE. CagE as a biomarker of the pathogenicity of Helicobacter pylori. *Rev Soc Bras Med Trop*; **46**(2): 185-9 (2013).
- Hanafi MI, Mohamed AM. Helicobacter pylori infection: seroprevalence and predictors among healthy individuals in Al Madinah, Saudi Arabia. *J Egypt Public Health Assoc*; **88**(1):40-5 (2013). doi: 10.1097/01.EPX.0000427043.99834.a4. PMID: 23528531.
- Al Faleh FZ, Ali S, Aljebreen AM, Alhammad E, Abdo AA. Seroprevalence rates of Helicobacter pylori and viral hepatitis A among adolescents in three regions of the Kingdom of Saudi Arabia: is there any correlation? *Helicobacter*. **15**(6):532-7 (2010).
- Khan MA, Ghazi HO. Helicobacter pylori infection in asymptomatic subjects in Makkah, Saudi Arabia. *J Pak Med Assoc*. **57**(3):114-7 (2007). PMID: 17432012.
- Nguyen T, Ramsey D, Graham D, Shaib Y, Shiota S, Velez M, et al. The Prevalence of Helicobacter pylori Remains High in African American and Hispanic Veterans. *Helicobacter*; **20**(4): 305-11 (2015).
- Kadi R, Halawani E, Abdelkader H. Prevalence of H. pylori strains harbouring cagA and iceA virulence genes in Saudi patients with gastritis and peptic ulcer disease. *Microbiology discovery*. (2014).
- Ayoola AE, Ageely HM, Gadour MO, Pathak VP. Prevalence of Helicobacter pylori infection among patients with dyspepsia in South- Western Saudi Arabia. *Saudi Med J*; **25**(10): 1433-8 (2004).

20. Tadesse, E., Daka, D., Yemane, D. *et al.* Seroprevalence of *Helicobacter pylori* infection and its related risk factors in symptomatic patients in southern Ethiopia. *BMC Res Notes*, **7**: 834 (2014).
21. Zhu Y, Zhou X, Wu J, Su J, Zhang G. Risk Factors and Prevalence of *Helicobacter pylori* Infection in Persistent High Incidence Area of Gastric Carcinoma in Yangzhong City. *Gastroenterol Res Pract.*; **2014**:481365 (2014).
22. Shin DW, Cho J, Kim SH, Choi HC, Son KY, Park SM, et al. Preferences for the “screen and treat” strategy of *Helicobacter pylori* to prevent gastric cancer in healthy Korean populations. *Helicobacter*, **18**(4):262–9 (2013).
23. Chen SY, Liu TS, Fan XM, Dong L, Fang GT, Tu CT, et al. [Epidemiological study of *Helicobacter pylori* infection and its risk factors in Shanghai]. *Zhonghua Yi Xue Za Zhi*, **85**(12):802–6 (2005).
24. Diaconu S, Predescu A, Moldoveanu A. *Helicobacter pylori* infection: old and new. *Journal of Medicine and Life*, **10**(2) (2017).
25. Oh D-Y, Choi KS, Shin H-R, Bang Y-J. Public awareness of gastric cancer risk factors and disease screening in a high risk region: a population-based study. *Cancer Res Treat*, **41**(2):59–66 (2009).
26. Abebaw W, Kibret M, Abera B. Prevalence and risk factors of *H. pylori* from dyspeptic patients in northwest Ethiopia: a hospital based cross-sectional study. *Asian Pac J Cancer Prev*, **15**(11):4459–63 (2014).
27. Lee YY, Ismail AW, Mustaffa N, Musa KI, Majid NA, Choo KE, et al. 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 (2012).