Journal of Multidisciplinary Healthcare

Dovepress
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ORIGINAL RESEARCH

Knowledge and Perception of Physicians of Different Specialties in Saudi Arabia Toward *Helicobacter pylori*

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Background: *Helicobacter pylori (H. pylori)* is a key pathogen causing several gastrointestinal diseases. Fortunately, *H. pylori* infection is treatable, which can lower its comorbidities. However, data assessing physicians' awareness of *H. pylori* is lacking in Saudi Arabia.

Objective: To assess the knowledge and awareness of physicians of different specialties who practice in Saudi Arabia about *H. pylori* infection.

Methods: This is a cross-sectional study conducted between May and September 2022 on physicians across all regions in Saudi Arabia using a validated online questionnaire covering their knowledge and awareness of *H. pylori* infection. An independent *t*-test, one-way ANOVA, and Games-Howell as a post hoc test were used to analyze the data. A General Linear Model was also employed to determine significant predictors among the variables reliant on *H. pylori* awareness.

Results: The results showed that the mean awareness score of 474 physicians was 76.99± 6.9, indicating that participants had sufficient knowledge about *H. pylori* infection. In general, the internal medicine specialists (28.3%) had better awareness of *H. pylori* infection than the other specialties. Moreover, the university hospital sector performed the best, scoring 80.68±13.3, and the southern region had the highest-ranked physicians with a score of 81.56 ±13.7 in terms of *H. pylori* awareness. Furthermore, the general linear model revealed a statistical significance ($p<0.05$) for the following demographic aspects concerning *H. pylori* awareness: the physicians' age group of 30–39 years, duration of experience of 11–15 years, the hospital sectors of Nation Guards (NGH) and Security Forces (SFH), and the southern and central regions of practice in Saudi Arabia.

Conclusion: Physicians in Saudi Arabia have relatively sufficient awareness of *H. pylori*; however, they are highly influenced by age, years of experience, the hospital sector involved, and the region where the physicians practice.

Keywords: *H. pylori*, awareness, doctors, internal medicine, gastroenterology

Introduction

Helicobacter pylori (H. pylori) is a human bacterium with a potential risk of gastric and intestinal cancer. It is a gram-negative bacterium that produces cytokines and contributes to systemic inflammation.[1] It can resist and tolerate the gastric acidic pH through several functional and structural mechanisms, thus maintaining chronic infection.[2] Infected people comprise over 50% of the world's population, with a significant regional variation.[3] *H. pylori* infection is substantially associated with several stomach-related cancers like gastric cancer and gastric lymphoma (MALT- mucosa-associated lymphoid tissue) are all substantially linked to *H. pylori* infection.[4] The symptoms include chronic or persistent bloating and nausea, weight loss or loss of appetite, malnutrition, heartburn, and indigestion. Furthermore, this bacterial infection has been associated with the

Received: 20 January 2023
Accepted: 14 March 2023
Published: 19 March 2023

development of atrophic inflammation of the stomach lining, which has several repercussions for gastric function.[5] Extra gastric manifestations are also linked to *H. pylori* infection.[6] For example, it has been attributed to the severity of psoriasis,[7] and it has been demonstrated that eliminating this infection could dramatically improve rosacea skin problems.[8] Diagnosis and therapy are usually based on the Maastricht V/Florence Consensus Report.[9] Stool antigen and urea breath testings are the common *H. pylori* diagnostic procedures.[9,10] Treatment includes a known standard combination of antibiotics and proton pump inhibitors. A 10–14 day treatment is preferable to eradicate the infection than a 7-day treatment.[9,11] However, the recurrence rate of infection and associated gastrointestinal disorders are well-documented challenges,[12] and antimicrobial resistance is becoming a concern for *H. pylori*, as shown in a survey conducted in Spain with a resistance level reaching up to 30%.[13] Saudi Arabian data on *H. Pylori* prevalence were not consistent, and it ranged from 70% in 1989 to 10.2% in 2018. Moreover, geographic location, diagnostic methods used, time period and specialty of the treating physician varied significantly.[14–19] Moreover, according to a systematic review compiling published epidemiological data on the incidence of cancers in Saudi Arabia between 2010–2019, the incidence of gastric cancer was found to be around 1.9%. However, no accurate data on its subtypes or link with H. pylori infection.[20]

Studies assessing the physicians' knowledge and awareness about *H. pylori* are limited. In 2003, the North American Society for Paediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) conducted an internet-based survey evaluating pediatric gastroenterologists' knowledge and practices regarding *H. pylori* that 514 NASPGHAN members completed. It was concluded that physicians were well informed about *H. pylori* infection in children despite the lack of published guidelines at the time of the survey. However, knowledge about antibiotic resistance rates was lacking.[21] A survey study from Turkey evaluating the knowledge, attitude, and practice (KAP) regarding *H. pylori* among general practitioners showed a significant lack of updated knowledge and deviated from the guidelines.[22] Furthermore, a retrospective study analyzing physicians' practices in treating *H. pylori* infection in Maryland, USA, found notable non adherence to the guidelines illustrated by the fact that one-third of the patients were not tested before treatment, and post-treatment testing was not appropriate.[23] Another cross-sectional study was done in Pakistan to assess KAP toward *H. pylori* and showed a lack of adequate knowledge in managing *H. pylori* infection among primary care physicians.[24] Moreover, a nationwide survey conducted in China between 2014 and 2017 investigated whether the clinical practice deviates from the guidelines. Awareness of *H pylori* infection and related diseases varied among physicians, ranging from 45% to 95%. Around 40% did not adhere to the diagnostic approach, therapeutic options were accurate in less than 70%, and 20% did not confirm eradication of the infection.[25]

In Saudi Arabia, Hafiz et al conducted a cross-sectional study using an online survey evaluating the degree of knowledge of *H. pylori* infection among undergraduate university students. Less than 10% of the study population had a good level of knowledge on the subject, and the level was significantly and proportionately associated with the following factors: university level, family monthly income, having heard about *H. pylori* infection, and having a previous history of *H. pylori* infection. Other demographic parameters (age, gender, number of siblings) and the field of university study (health science versus non-health science) were not associated with the degree of knowledge of *H. pylori*.[26] Up to the date of conducting this survey, we could not find any study in Saudi Arabia evaluating knowledge and awareness about *H. pylori* among physicians of different specialties since day-to-day clinical practice shows that many healthcare disciplines surprisingly deal with *H. pylori* infection in the absence of local guidelines on this matter. Hence, the purpose of this study is to lay the ground for further research assessing clinical practice against the guidelines and health policy formulation in line with the anticipated publication of practice guidelines for managing *H. pylori* infection by "The Saudi H. pylori Working Group recommendations" which was yet to be published by the time we conducted this study.

Methods

This cross-sectional survey-based study used a validated online questionnaire to collect data from voluntary participants after obtaining informed consent. A minimum of 385 participants sample size was decided based on a confidence level of 95% and a margin of error of 5%. A convenience sampling technique was used to collect the data between May 2022 and September 2022. The inclusion criterion was all Saudi and non-Saudi physicians of different specialties who were working in the Kingdom of Saudi Arabia during the study period. Non-physicians or physicians who were not working in Saudi Arabia or did not agree to complete the survey were excluded. The questionnaire was based on a previous similar study with permission granted by the first author, Taghreed A Hafiz.[26] However, the sociodemographic part was modified to suit our study population. It was constructed on Google

Forms to allow ease of dissemination and automatic capturing of the completed surveys. It was then distributed electronically via text messages to the enrolled physicians on their phones through the researchers of this study, who had access to the participants' contact information. However, it was an open survey. The Informed consent was embedded at the beginning of the survey. Nevertheless, the collected data were secure, protected, and without unique identifiers of the participants.

Simple descriptive statistics were used to analyze this research. For the categorical and nominal variables, we used them to specify the characteristics of the demographics in the form of numbers and percentages. Means and standard deviations were used to represent continuous variables. A score of *H. pylori* awareness was determined by translating the answers to the questions into the numbers 0 and 1, which stand for "unaware" and "aware", respectively.

After converting each response, a simple additive method was used to obtain the total score, and the total score was converted to a hundred-point scale. Moreover, to assess the internal consistency of a questionnaire (or survey), we used reliability analysis with a model by Alpha (Cronbach). An independent *t*-test was used to compare two group means to establish a relationship between outcome and demographics. A one-way ANOVA test with Games-Howell as a post hoc test was utilized for more than two groups. A general linear model (GLM) was also employed to discover significant variables or demographic data predictors. Finally, the null hypothesis was rejected using a conventional p-value of 0.05.

Results

Socio-Demographic Characteristics

Four hundred seventy-four (474) physicians completed the online survey. Most participants were men (67.3%), and the majority were 25–29 years (53.6%). Most participants were resident physicians (56.1%) with <5 years of experience (58.9%). Half of them (46.4%) worked in the Ministry of Health (MOH). Among the doctors surveyed, most practice in the central region of Saudi Arabia (24.1%), predominantly in Riyadh city. In addition, most doctors were in internal medicine (28.3%), with the rest being in other disciplines. Table 1 summarizes the demographics of the participants.

Table 1 Characteristics of Physicians Who Responded to the Questionnaire

Demographics		Count	%
Total		474	100.0
Gender	Male	319	67.3
	Female	155	32.7
Age in years	25–29	254	53.6
	30–39	114	24.1
	40–50	74	15.6
	More than 50	32	6.8
Level of experience	Consultant	111	23.4
	Assistant consultant	54	11.4
	Fellowship	43	9.1
	Resident	266	56.1
Years of experience	Less than 5 years	279	58.9
	5 to10 years	93	19.6
	11 to 15 years	38	8.0
	More than 15 years	64	13.5
Hospital sector	Ministry of Health	220	46.4
	National Guard Hospital	20	4.2
	Medical City	25	5.3
	Armed Forces	65	13.7
	Security Forces	13	2.7
	Private Hospital / Polyclinic	49	10.3
	Primary Care	21	4.4
	University Hospital	61	12.9

(*Continued*)

Table 1 (Continued).

Demographics		Count	%
Residence in the Kingdom of Saudi Arabia	Northern Region	74	15.6
	Eastern Region	81	17.1
	Central Region	114	24.1
	Southern Region	105	22.2
	Western Region	100	21.1
Specialty	Anesthesiology / Intensive care	21	4.4
	Dermatology	10	2.1
	Emergency medicine	6	1.3
	Ear, Nose and Throat (ENT)	13	2.7
	Family medicine	61	12.9
	General practitioner	26	5.5
	General / pediatric surgery	52	11
	Internal medicine	142	30
	Medical microbiology / Immunology	3	0.6
	Neurosurgery	3	0.6
	Obstetrics and gynecology	15	3.2
	Ophthalmology	26	5.5
	Orthopedics	6	1.3
	Pediatric	38	8.0
	Pathology	9	1.9
	Pharmacology	3	0.6
	Physiology	2	0.4
	Plastic surgery	7	1.5
	Preventive medicine / public health	7	1.5
	Psychiatry	13	2.7
	Radiology	5	1.1
	Urology	6	1.3
Medical subspecialty	Cardiology	17	3.6
	Critical care medicine	16	3.4
	Endocrinology	10	2.1
	Gastroenterology	40	8.4
	Hematology	7	1.5
	I am not an internal medicine specialist	353	74.5
	Infectious disease	5	1.1
	Nephrology	4	0.8
	Neurology	5	1.1
	Oncology	3	0.6
	Pulmonology	8	1.7
	Rheumatology	6	1.3

Knowledge About *H. pylori* Among Physicians

The average *H. pylori* awareness of the physicians who participated scored 76.99± 6.9. This indicates that most surveyed participants had sufficient knowledge of *H. pylori* infection. The results revealed that 91.6% of the participants were aware of *H. pylori* being a bacterium that causes stomach ulcers. A total of 58.6% responded that socioeconomic status is one of the contributing factors for this infection, and 88.6% of participants knew that hand washing is a preventive measure for *H. pylori* infection. As for testing choice to diagnose the infection, 87.8% chose the urea breath test, while the stool antigen test was the option to know the presence of *H. pylori*. Additionally, the majority of participants (88.4%) indicated that *H. pylori* infection is the primary cause of stomach cancer which happens when infectious bacteria start to

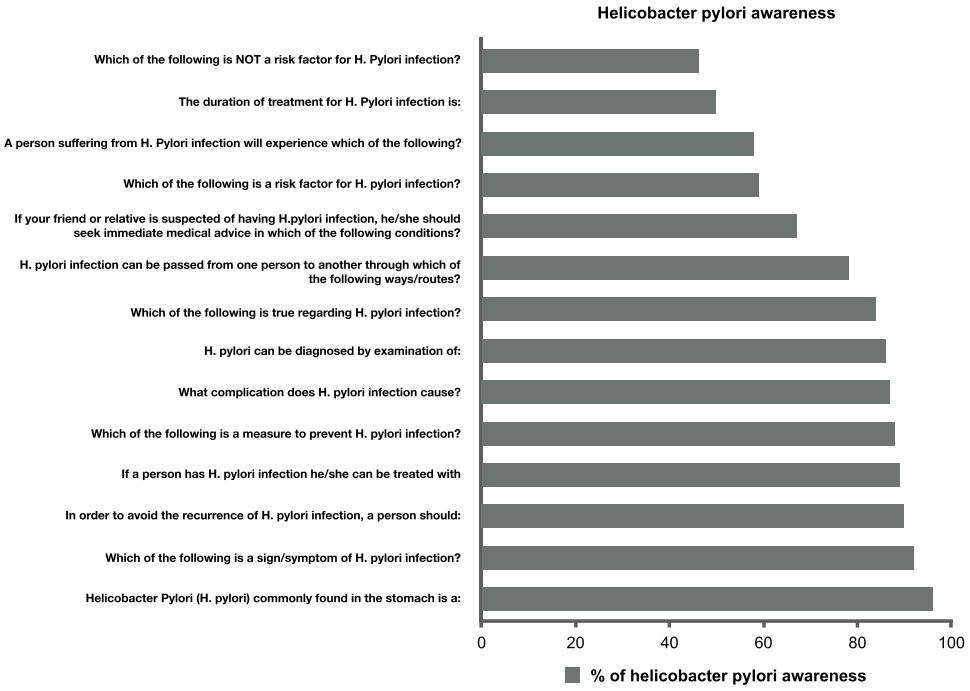

Figure 1 Summary of physicians' awareness of *H. pylori* infection in Saudi Arabia.

break down the stomach lining and release a toxic substance that damages cells. A summary of the physician's responses is shown in Figure 1.

Statistically Significant Factors in *H. pylori* Awareness Among Physicians

Using a one-way ANOVA test and Games-Howell, the hospital sector and the region of practice were found to be substantially associated with *H. pylori* awareness, with p-values of 0.007 and 0.001, respectively. Overall, the university hospital sector performed the best, scoring 80.68±13.3 in terms of *H. pylori* awareness. At the same time, the southern region had the highest-ranked physicians with an awareness score of 81.56 ±13.7 for *H. pylori* infection. The eastern, western, and northern regions received close statistical measurements. Table 2 shows the detailed results of this analysis. Employing the general linear model to examine the relationships between the demographics and *H. pylori* awareness, a statistical significance of <0.05 was found for the following: physicians' age group of 30–39-year (p = 0.025), duration

Table 2 Relationship Between the Demographics and *Helicobacter pylori* Awareness

Demographics		Total	Awareness Level	p-value
Total		474	76.99 ± 16.9	-
Gender	Male	319	77.23 ± 16.4	0.660
	Female	155	76.50 ± 18.0	
Age in years	25–29	254	75.45 ± 18.6	0.132
	30–39	114	79.89 ± 14.7	
	40–50	74	77.80 ± 13.8	
	More than 50	32	77.01 ± 16.8	
Level of experience	Consultant	111	79.67 ± 13.0	0.299
	Assistant consultant	54	76.06 ± 19.3	
	Fellowship	43	76.74 ± 20.6	
	Resident	266	76.10 ± 17.2	

(*Continued*)

Table 2 (Continued).

Demographics		Total	Awareness Level	p-value
Years of experience	Less than 5 years	279	76.04 ± 17.3	0.175
	5 to10 years	93	79.11 ± 18.7	
	11 to 15 years	38	74.25 ± 17.5	
	More than 15 years	64	79.69 ± 10.9	
Hospital sector	Ministry of Health	220	77.92 ± 16.0^{A}	0.007^{a,b}
	National Guard	20	66.07 ± 24.6^{A}	
	Medical City	25	73.71 ± 19.3^{A}	
	Armed Forces	65	77.69 ± 15.7^{A}	
	Security Forces	13	65.38 ± 24.7^{A}	
	Private Hospital / Polyclinic	49	75.95 ± 16.7^{A}	
	Primary Care	21	78.23 ± 18.1^{A}	
	University Hospital	61	80.68 ± 13.3^{A}	
Residence in the Kingdom of Saudi Arabia	Northern Region	74	73.75 ± 17.8^{AC}	0.001^{a,b}
	Eastern Region	81	74.60 ± 22.7^{ABC}	
	Central Region	114	79.64 ± 13.7^{AB}	
	Southern Region	105	81.56 ± 13.7^{B}	
	Western Region	100	73.50 ± 16.0^{C}	

Notes: [a]Statistically significant using One-Way ANOVA Test at <0.05 level. [b]Post-hoc test = Games-Howell. CAPITAL letters indicate post-Hoc multiple pairing summary indicator. Having the same letter means the same measure statistically.

of experience of 11–15 years (p = 0.018), hospital sector of NGH (p = 0.006) and security forces (p = 0.011), and region of practice in the southern (p=0.004) and central (p = 0.010) regions of Saudi Arabia. Table 3 illustrates the results of the general linear model.

Table 3 Demographic Predictions for *Helicobacter pylori* Knowledge

Dependent Variable: *Helicobacter pylori* Awareness				
Parameter	**B**	**95% Confidence Interval**		**p-value**
		Lower Bound	**Upper Bound**	
Intercept	75.262	65.645	84.879	<0.001[a]
Gender = Male	−0.295	−3.627	3.038	0.862
Age in years = 25–29	8.082	−1.997	18.161	0.116
Age in years = 30–39	10.704	1.350	20.058	0.025[a]
Age in years = 40–50	5.178	−2.446	12.801	0.183
Level of experience = Consultant	1.179	−4.624	6.981	0.690
Level of experience = Assistant consultant	−0.865	−7.148	5.418	0.787
Level of experience = Fellowship	−1.360	−7.825	5.105	0.679
Years of experience = Less than 5 years	−8.152	−17.104	0.799	0.074
Years of experience = 5 to10 years	−6.258	−14.440	1.925	0.134
Years of experience = 11 to 15 years	−9.755	−17.827	−1.683	0.018[a]
Hospital sector = Ministry of Health	−1.359	−6.349	3.631	0.593
Hospital sector = National Guard Hospital	−12.184	−20.860	−3.507	0.006[a]
Hospital sector = Medical City	−4.934	−13.062	3.195	0.234
Hospital sector = Armed Forces	−0.516	−6.819	5.787	0.872
Hospital sector = Security Forces	−13.206	−23.350	−3.061	0.011[a]
Hospital sector = Private Hospital / Polyclinic	−3.786	−10.216	2.643	0.248
Hospital sector = Primary Care	0.942	−7.637	9.521	0.829

(*Continued*)

Table 3 (Continued).

Dependent Variable: *Helicobacter pylori* Awareness				
Parameter	**B**	**95% Confidence Interval**		**p-value**
		Lower Bound	**Upper Bound**	
Residence in Saudi Arabia = Northern Region	−1.007	−6.283	4.269	0.708
Residence in Saudi Arabia = Eastern Region	1.772	−3.177	6.722	0.482
Residence in Saudi Arabia = Central Region	6.039	1.452	10.626	0.010[a]
Residence in Saudi Arabia = Southern Region	7.023	2.259	11.787	0.004[a]

Notes: [a]Statistically significant using General Linear Model at <0.05 level.

Discussion

One of the most prevalent infectious diseases around the world is *H. pylori*.[27–29] It is responsible for almost 15 thousand mortalities yearly, most of which are caused by chronic gastritis and peptic ulcer disease.[30] To the best of our knowledge, this was the first study to analyze Saudi physicians' knowledge and awareness about *H. pylori*. It has been demonstrated that health practitioners in Saudi Arabia have good knowledge and practices that are crucial to the successful screening and eradication rate of this infection, which would help reduce the risk of gastric cancer. *H. pylori* prevalence varies by country and demography. Although other variables may contribute to these differences, genetic predisposition, geography, differences in food consumption and hygiene practices, and socioeconomic class are thought to be the primary causes. The age group between 25 and 29 years had the highest rate of *H. pylori* infection.[31]

Our study revealed that internal medicine specialists scored the highest among others. This result follows a study that showed that internists in Rasht, Iran, scored higher on knowledge tests than general practitioners. The author explained that residents have done more studies in this field and are experienced in practice since they visited more patients.[31]

Overall, the results of this study indicate that physicians in Saudi Arabia have a good command of *H. pylori* knowledge. For treating gastrointestinal problems to be more effective, knowledge about it among doctors and the public needs to be increased. Survey research was undertaken in China to investigate the level of knowledge of 546 physicians from various disciplines about *H. pylori* infection compared to the general population. Based on the results, physicians' knowledge was expected to be higher than that of the general population. Still, the authors found a surprising lack of support for *H. pylori* testing among gastroenterologists.[32]

Regarding the practice of *H. pylori*, the present study showed that most participants know how to manage the infection. This is in contrast to the previous survey studies conducted in Turkey, Maryland (USA), Pakistan, and China, where the evaluation of the knowledge, attitude, and practice regarding *H. pylori* among general practitioners showed a lack of updated knowledge and variable practices deviating from the guidelines in term of diagnostic testing, accurate therapeutic approaches and confirmation of eradication.[22–25] Moreover, by the time of writing this manuscript, we found a very recent publication of a questionnaire-based cross-sectional study done in Al-Madinah city, Saudi Arabia evaluating the adequacy of *H. pylori* eradication practices among 100 primary care physicians where the authors found an unsatisfactory level of practice regarding *H. pylori* eradication.[33]

The participating physicians in our study were highly diverse; nevertheless, our study did not assess patients' data in terms of diagnosis, management, and treatment outcomes to objectively evaluate the current practices, which is the main limitation. Furthermore, the Saudi Gastroenterology Association published the practice guidelines of the Saudi *H. pylori* Working Group Recommendations in October 2022.[34] Therefore the door is open for future research prospects involving these local guidelines.

Conclusion

Our study concluded that adequate knowledge and perception of *H. pylori* infection was identified among physicians of various specialties working in Saudi Arabia. Age, years of experience, the hospital sector, and the region where the

physicians' practice were the main influencing factors. Further studies are recommended to assess adherence to guidelines in diagnosing and managing *H. pylori* infection.

Data Sharing Statement

All data associated with this study are present in the paper.

Ethical Approval

The study was approved by the Institutional Review Board at Imam Mohammad Ibn Saud Islamic University with IRB No. 249/2022. Informed consent was embedded at the beginning of electronic survey. This study was conducted in accordance with the World Medical Association (WMA) Declaration of Helsinki.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that there are no conflicts of interests in this work.

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