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KNOWLEDGE AND AWARENESS LEVEL OF THE GENERAL POPULATION OF SAUDI ARABIA REGARDING HELICOBACTER PYLORI INDUCED GASTRIC ULCERS AND CANCER: A CROSS- SECTIONAL STUDY

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Abstract:

Background: Helicobacter pylori (H. pylori) is a bacterium that infects the stomach. It is the most ,common bacterial infection in the world. H. pylori infection can cause a variety of gastric diseases .including gastritis, gastric ulcer, and gastric cancer. The purpose of this study was to assess Knowledge and Awareness level of Saudi population regarding Helicobacter Pylori induced gastric ulcer and cancer.

Methods: A cross-sectional study involving 28 item questionnaire-based assessment was carried out by enrolling and taking prior consent for Saudi people of either sex aged above 18 years. The study instrument was divided into three modules allocating questions and analyzed.

Results: As regard knowledge and awareness score about H.Pylori, a majority of the respondents (51.6%) possess a low level of knowledge about this common gastric pathogen. (37.8%) exhibits a moderate level of understanding and a relatively small percentage (10.6%) with a high level of knowledge and awareness. Regarding the attitude score about H.Pylori, 47.4%, exhibited a neutral attitude. Conversely, a significant proportion, 33.2%, demonstrated a positive attitude and 19.4% of the respondents exhibited a negative attitude.

Conclusion: the study revealed a concerning lack of knowledge and awareness among the general population regarding Helicobacter pylori-induced gastric ulcers and cancer. The majority of respondents exhibited a low level of knowledge about this common gastric pathogen, highlighting the need for educational initiatives and public awareness campaigns.

Keywords: H. pylori, gastric ulcer, gastric cancer, knowledge and awareness, Saudi Arabia.

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Introduction:

The stomach is placed between the oesophagus and the small intestine in the digestive tract. The stomach releases chemicals and gastric acid to help in food breakdown. In addition, it releases the intrinsic factor essential for vitamin B12 absorption. A mucous membrane made up of columnar epithelial cells and glands lines the stomach. These cells are susceptible to gastritis, which may develop to peptic ulcers and, eventually, cancer of the stomach [1] . Gastric cancer is considered the fourth most common that lead to cancer which is related to deaths globally [2]. Helicobacter pylori is a human bacterium that may lead to intestinal and gastric cancer. It is a gram-negative bacterium which contributes to systemic inflammation via the producing of cytokines [3]. Helicobacter pylori are bacterial pathogens that is transmitted from human to another through oral routes and lead to chronic gastritis in all individuals [4]. One of the most prevalent neoplasms and the fourth leading cause of cancer-related death worldwide is stomach cancer [5]. A H. pylori infection increases a person's risk of developing non-cardia stomach cancer by three times compared to a person who does not have the infection [6]. Multiple research studies have been carried out to evaluate how well the general public is aware of GI tract illness, symptoms, and risk factors in various areas targeted at different groups of people.

A study was done in Al-Baha city, Saudi Arabia aimed to measure the Al-Baha residents' awareness of stomach cancer risk factors and warning signs. According to the survey's findings, participants' knowledge was moderate, with substantial variation depends on respondents' characteristics including gender, ages and occupations. Males had a higher level of awareness than females. It varies according to ages, with those equal or under the age of 20 have a better understanding of stomach cancer than those beyond it. [7]. Another study also was conducted in Saudi Arabia talked of Knowledge, Attitudes, and Practices Among Saudis about Risk of Helicobacter Pylori Infection.The study found that (80.1%) of those surveyed were aware about H. pylori. (85.7%) believe that HP infection usually resolves without any intervention, and (51.2%) were unaware that H. pylori can be spread between closed members like the family. The good thing that (83.2%) of individual were knowledgeable about of HP symptoms. However, just (49.4%) thought that patients with H.pylori if left without treatment may go through stomach cancer [8]. One study was conducted in the United Arab Emirates, specifically in Sharjah, it assessed the awareness level toward H.pylori and its relationship with gastric ulcer and cancer.it was found that understanding and awareness of H. pylori was very low among the population with just 24.6% were aware of it. 61% of those surveyed were unaware of the association between H. pylori and stomach cancer. Only 3% of the individuals linked emotional distress to the appearance of stomach ulcers. The awareness level regarding the H. pylori is higher in females than males. Participants with a medical education often outperformed their colleagues in other fields of work in terms of knowledge [9] . Despite H. pylori being known to be a carcinogenic agent causing gastric cancer, General awareness about H. pylori-induced gastric ulcers and cancers is poor.

The results of this study can be a springboard for developing fresh educational initiatives and public awareness campaigns that highlight this health issue, which might be easily averted with early detection, prevention, and intervention.

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Objectives:
The aim of this study was to assess the level of knowledge and awareness of the general population of Saudi Arabia regarding helicobacter pylori induced gastric ulcers and cancer.

Methodology:
This is a descriptive cross-sectional study that was conducted between July 2023 and May 2024 on the general population of Saudi Arabia across all regions of the kingdom. The study was carried out using a well-structured online questionnaire. The study's population consisted of Saudi citizens in both gender adult above the age 18. Participants were recruited from people receiving questionnaire.

Sample size:
The sample size was calculated by Raosoft at 384 individuals based on 5% marginal error and 95% confidence level using this formula: n= P (1-P) * Zα 2 / d 2 with a confidence level of 95%.
n: Calculated sample size
Z: The z-value for the selected level of confidence (1- a) =
1.96.
P: An estimated knowledge
Q: (1 – 0.50) = 50%, i.e., 0.50
D: The maximum acceptable error = 0.05. So, the calculated minimum sample size was:
n = (1.96)2 X 0.50 X 0.50/ (0.05) 2 = 384.

Methods for data collection and in instrument (Data collection Technique and tools):
Structured questionnaire was used as a study tool. This tool was developed after consulting relevant studies conducted in Saudi Arabia and elsewhere the final version of the questionnaire consisted of 28 with 4 sections, Population in Saudi
Arabia demographics (n = 9), knowledge (n = 13), attitudes (n = 1), and behaviors (n = 5). Data on the participants' gender, age, country, degree of education, and line of job was gathered using demographic questionnaires. Participants were also questioned on any present symptoms or past medical issues. Multiple-choice questions were used to measure participants' knowledge about H. pylori and stomach ulcers in general as well as their specific degree of expertise. Using multiple choice questions and a 3-point Likert scale, attitudes toward preventing stomach ulcers and avoiding H. pylori infection were also evaluated. Multiple choice questions concerning the participants' typical practices were included in the category of practices.

Scoring system of knowledge & awareness:
There were thirteen main questions used to assess the knowledge regarding the H.pylori and gastric ulcer. For the first eleven questions , (1) score was given for the each correct answer , and(0) score was given if the participant chose the incorrect option or I don't know answer . Five-point scale was used for last two questions regarded from 1-5 as strongly agree to strongly disagree. Total knowledge scores were categorized into 3 levels based on The original Bloom's cut -off point , 80%-100%(high level), 60%-79% (moderate level), <_59%(low level). The scores for knowledge varied from 1 to 62 points,

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and were classified into three levels as follows: High level (50 points or more.),Moderate level (49-38 points), Low level (37 points or less).

Scoring system of attitude:

There were six questions to assess Attitude and behavior towards prevention of H.pylori infection. One of these questions has more than one correct answer, there will be 1 score for each correct answer. Third -point scale was used in 5 of these questions, regarded from 0-2 as agree to I don't know. The score of 11 or more considered a positive attitude.10-8 considered a neutral attitude. 7 and less considered a negative attitude.

Analyzes and entry method:
Data was entered on the computer using the "Microsoft Office Excel Software" program. (2016) for windows. Data was then transferred to the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0.Armonk, NY: IBM Corp.) to be statistically analyzed.

Results:

Table (1) displays various demographic parameters of a group of people with a total number of (603). The provided data offers valuable insights into the sociodemographic characteristics of the participants (n=603) involved in the study. The mean age of the participants is 34.3 years, with a standard deviation of 15.8 years, indicating a diverse age range. The sample is predominantly female, comprising 57% of the participants, while the remaining 43% are male. Regarding marital status, the majority of the participants (52.2%) are single, followed by married individuals (43.9%), with a small percentage of divorced (2.7%) and widowed (1.2%) participants. The vast majority of the participants (93.9%) reside in urban areas, with only 6.1% residing in rural villages. The geographical distribution of the participants is skewed towards the Western region, which accounts for 45.6% of the sample, followed by the Central region (31%), Southern region (13.8%), Eastern region (7.3%), and Northern region (2.3%). The educational attainment of the participants is diverse, with the majority (49.8%) holding a bachelor's degree, followed by high school graduates (24.4%), postgraduate degree holders (13.8%), and those with a diploma (7.3%). The sample also includes a small percentage of participants with primary school (1.2%), middle school (3.3%), and illiterate (0.3%) educational backgrounds. In terms of occupation, the sample is predominantly composed of students (39.6%), followed by employees (27.2%), unoccupied individuals (17.1%), and retired participants (15.4%). Only a small fraction of the participants are employed in the medical (0.3%) and non-medical (0.3%) fields. Regarding the participants' experience with Helicobacter pylori, 18.9% of the sample have personally experienced an infection, while 46.6% have had a family member with the same illness. The majority of the participants (55.4%) have learned about Helicobacter pylori from non-medical sources, such as relatives, acquaintances, or media, while 34.8% have obtained information from medical sources, such as healthcare professionals or during the study. The comprehensive sociodemographic data presented in this table provides a detailed understanding of the characteristics of the study population, which is

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crucial for interpreting the findings and assessing the generalizability of the results to the broader target population.

Table (1): Sociodemographic characteristics of participants (n=603)

Parameter		***No.***	***Percent (%)***
Age (Mean:34.3, STD:15.8)	21 or less	147	24.4
	21 to 25	144	23.9
	25 to 50	176	29.2
	more than 50	136	22.6
Gender	Female	344	57.0
	Male	259	43.0
Marital status	Single	315	52.2
	Married	265	43.9
	Divorced	16	2.7
	Widowed	7	1.2
Place of residence	Village	37	6.1
	City	566	93.9
Region of residence	Northern region	14	2.3
	Southern region	83	13.8
	Central region	187	31.0
	Eastern region	44	7.3
	Western region	275	45.6
Education level	Primary School	7	1.2
	Middle School	20	3.3
	High School	147	24.4
	Diploma	44	7.3
	Bachelor’s degree	300	49.8
	Postgraduate degree	83	13.8
	Illiterate	2	.3
Occupation	Student	239	39.6
	Medical field	2	.3
	Non-medical field	2	.3
	Employee	164	27.2
	Retired	93	15.4
	Unoccupied	103	17.1
Have you ever experienced an infection with Helicobacter pylori?	No	489	81.1
	Yes	114	18.9
	No	322	53.4

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Has anyone in your family ever had an illness with Helicobacter pylori?	Yes	281	46.6
From where did you learn about Helicobacter pylori?	Medical sources (obtained from healthcare professionals or used during the study)	210	34.8
	Non-medical sources (via relatives, acquaintances, or media on TV, radio, or social media)	334	55.4
	Others	59	9.8

As shown in figure 1, The figure displays the sources from which individuals have learned about Helicobacter pylori, a bacterium that is a significant contributor to various gastrointestinal conditions, including chronic gastritis, peptic ulcers, and even gastric cancer. The data presented suggests that the majority of respondents, 334 individuals, have acquired their knowledge of H. pylori from non-medical sources, such as relatives, acquaintances, or media outlets like television, radio, or social media. In contrast, a smaller proportion, 210 individuals, have obtained their information about this bacterium from medical sources, presumably through healthcare professionals or during the course of a medical study. The remaining 59 respondents have learned about H. pylori from unspecified "other" sources. This distribution of information sources highlights the importance of ensuring that accurate and up-to-date medical information is readily available and accessible to the general public, as non-medical sources may not always provide reliable or comprehensive information. Healthcare providers and public health organizations should strive to actively disseminate evidence-based knowledge about H. pylori and its associated health implications, thereby empowering individuals to make informed decisions about their own healthcare. Additionally, the high proportion of non-medical sources underscores the need for educational campaigns and initiatives that can effectively reach and inform the broader community about this significant bacterial pathogen and its management.

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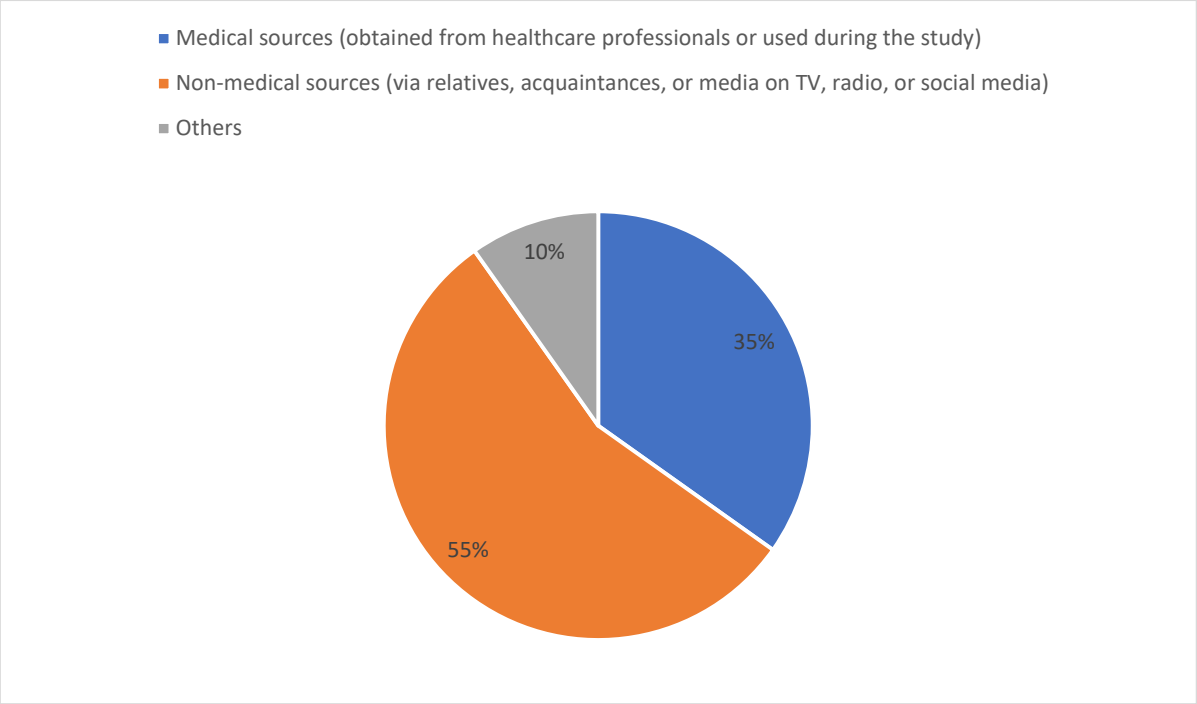
Figure (1): Illustrates the source of information regarding H. Pylori infection among participants.



As illustrated in table (2), The data presented in the table provides valuable insights into the participants' knowledge and understanding of Helicobacter pylori (H. pylori), a prevalent bacterium that plays a significant role in various gastrointestinal conditions. The results suggest that a substantial portion of the participants hold misconceptions or lack comprehensive knowledge about the nature and transmission of this pathogen. Regarding the nature of H. pylori, a significant proportion of the participants incorrectly believed that it is a virus (30.3%), a fungus (11.3%), or a parasite (13.4%), rather than the correct identification as a bacterium (57.2%). This indicates a need for more targeted education and awareness campaigns to ensure that the general public, and potentially healthcare professionals, have a accurate understanding of the microbiological nature of H. pylori. The data also reveals gaps in the participants' knowledge about the colonization of H. pylori within the human body. While a vast majority correctly identified the stomach as the primary site of H. pylori colonization (91.7%), a substantial number of participants were uncertain or held incorrect beliefs about the bacterium's presence in other organs, such as the brain (32.3% uncertain), heart (34.8% uncertain), liver (34.7% uncertain), and lungs (35.0% uncertain). This underscores the importance of providing comprehensive information about the specific tropism and distribution of H. pylori within the human host. Furthermore, the data sheds light on the participants' understanding of H. pylori transmission routes. The majority correctly identified contaminated water (68.3%) and contaminated food (81.8%) as potential transmission methods, but a significant proportion were unaware or held misconceptions about other routes, such as transmission through saliva (31.8% uncertain), air (39.6% uncertain), and sexual contact (41.6% uncertain). Strengthening public awareness and education around the various modes of H. pylori transmission would be crucial in promoting effective prevention and control strategies. Overall, the findings from this survey highlight the need for comprehensive and targeted educational interventions to improve the general public's knowledge and understanding of H. pylori. By addressing the identified

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gaps and misconceptions, healthcare professionals and public health authorities can contribute to enhancing the community's awareness, enabling more informed decision-making, and ultimately, improving the prevention and management of H. pylori-related health conditions.

Table (2): Parameters related to participants' knowledge of H. Pylori (n=603).

Parameter		***No.***	***Percent (%)***
what Is the nature of Pylori? a virus?	Yes	183	30.3
	No	230	38.1
	I don't know	190	31.5
what Is the nature of Pylori? a bacterium?	Yes	345	57.2
	No	109	18.1
	I don't know	149	24.7
what Is the nature of Pylori? a fungus?	Yes	68	11.3
	No	309	51.2
	I don't know	226	37.5
what Is the nature of Pylori? a parasite?	Yes	81	13.4
	No	280	46.4
	I don't know	242	40.1
Which of the following organs does Pylori colonies in? Brain?	Yes	29	4.8
	No	379	62.9
	I don't know	195	32.3
Which of the following organs does Pylori colonies in? Heart?	Yes	27	4.5
	No	366	60.7
	I don't know	210	34.8
Which of the following organs does Pylori colonies in? Stomach?	Yes	553	91.7
	No	7	1.2
	I don't know	43	7.1
Which of the following organs does Pylori colonies in? Liver?	Yes	93	15.4
	No	301	49.9
	I don't know	209	34.7
Which of the following organs does Pylori colonies in? Lung?	Yes	38	6.3
	No	354	58.7
	I don't know	211	35.0
What is the method of Helicobacter pylori transmission? Blood?	Yes	115	19.1
	No	264	43.8
	I don't know	224	37.1
What is the method of Helicobacter pylori transmission? Saliva?	Yes	246	40.8
	No	165	27.4
	I don't know	192	31.8

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What is the method of Helicobacter pylori transmission? Contaminated water?	Yes	412	68.3
	No	65	10.8
	I don't know	126	20.9
What is the method of Helicobacter pylori transmission? Contaminated food?	Yes	493	81.8
	No	29	4.8
	I don't know	81	13.4
What is the method of Helicobacter pylori transmission? Air?	Yes	59	9.8
	No	305	50.6
	I don't know	239	39.6
What is the method of Helicobacter pylori transmission? Sexual contact?	Yes	57	9.5
	No	295	48.9
	I don't know	251	41.6
What is the method of Helicobacter pylori transmission? Contaminated surfaces?	Yes	216	35.8
	No	176	29.2
	I don't know	211	35.0

As illustrated in table (3), The provided data offers valuable insights into the participants' knowledge and understanding of Helicobacter pylori infection and its associated symptoms, diagnostic methods, and treatment approaches. Overall, the results suggest a mixed level of awareness among the respondents, with some areas of knowledge being more comprehensive than others. One notable finding is the high percentage of participants (90.4%) who recognized that stomach pain can occur during H. pylori infection, indicating a strong understanding of this common symptom. Similarly, a majority of respondents were aware that H. pylori infection can lead to nausea or vomiting (84.9%) and abdominal bloating (78.1%). However, the knowledge about other potential symptoms, such as headache, back pain, chest pain, cough, rash, shortness of breath, fever, and fatigue, was more varied, with a significant portion of participants either unaware or unsure of their association with H. pylori infection. Regarding the diagnostic methods for H. pylori, the respondents demonstrated a relatively good understanding, with a majority being aware of stool analysis (70.3%), blood tests (56.1%), and endoscopy with biopsy (53.4%) as diagnostic tools. However, the knowledge about other tests, such as urine analysis and urea breath test, was less comprehensive. The data also highlights the participants' understanding of H. pylori treatment options. A large majority (90.7%) were aware of medical treatments, while the knowledge about herbal treatments and the self-limited nature of the disease was more limited. Additionally, the survey results indicate that a significant proportion of participants (57.5%) recognized the potential role of chronic stress in exacerbating the symptoms caused by H. pylori infection, suggesting a broader awareness of the complex interplay between psychological and physiological factors in the management of this condition. Overall, the data provides a valuable snapshot of the participants' knowledge and highlights areas where further education and awareness-raising efforts may be beneficial to improve the understanding and management of H. pylori infection within the studied population.

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Table (3): Parameters related to participants' knowledge of H. Pylori (n=603).

Parameter		***No.***	***Percent (%)***
Headache can occur during infection by Helicobacter pylori	Yes	179	29.7
	No	219	36.3
	I don't know	205	34.0
Stomach pain can occur during infection by Helicobacter pylori	Yes	545	90.4
	No	11	1.8
	I don't know	47	7.8
Back pain can occur during infection by Helicobacter pylori	Yes	141	23.4
	No	236	39.1
	I don't know	226	37.5
Chest pain can occur during infection by Helicobacter pylori	Yes	145	24.0
	No	253	42.0
	I don't know	205	34.0
Nausea or vomiting can occur during infection by Helicobacter pylori	Yes	512	84.9
	No	19	3.2
	I don't know	72	11.9
Cough can occur during infection by Helicobacter pylori	Yes	126	20.9
	No	278	46.1
	I don't know	199	33.0
Abdominal bloating can occur during infection by Helicobacter pylori	Yes	471	78.1
	No	35	5.8
	I don't know	97	16.1
Rash in the skin can occur during infection by Helicobacter pylori	Yes	72	11.9
	No	289	47.9
	I don't know	242	40.1
Shortness of breath can occur during infection by Helicobacter pylori	Yes	188	31.2
	No	208	34.5
	I don't know	207	34.3
Fever can occur during infection by Helicobacter pylori	Yes	222	36.8
	No	196	32.5
	I don't know	185	30.7
Fatigue can occur during infection by Helicobacter pylori	Yes	319	52.9
	No	117	19.4
	I don't know	167	27.7
Helicobacter Pylori is diagnosed by clinical examination	Yes	218	36.2
	No	224	37.1

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	I don't know	161	26.7
Helicobacter Pylori is diagnosed by Stool analysis test	Yes	424	70.3
	No	65	10.8
	I don't know	114	18.9
Helicobacter Pylori is diagnosed by Blood test	Yes	338	56.1
	No	117	19.4
	I don't know	148	24.5
Helicobacter Pylori is diagnosed by Urine analysis test	Yes	150	24.9
	No	264	43.8
	I don't know	189	31.3
Helicobacter Pylori is diagnosed by Endoscopy & biopsy	Yes	322	53.4
	No	102	16.9
	I don't know	179	29.7
Helicobacter Pylori is diagnosed by Urea breath test	Yes	219	36.3
	No	137	22.7
	I don't know	247	41.0
How to treat Helicobacter pylori? Herbal treatments?	Yes	131	21.7
	No	300	49.8
	I don't know	172	28.5
How to treat Helicobacter pylori? Medical treatments?	Yes	547	90.7
	No	11	1.8
	I don't know	45	7.5
How to treat Helicobacter pylori? Self-limited disease?	Yes	41	6.8
	No	373	61.9
	I don't know	189	31.3
Chronic stress may increase symptoms caused by helicobacter pylori infection	Yes	347	57.5
	No	54	9.0
	I don't know	202	33.5
Helicobacter pylori can cause stomach ulcers	Yes	360	59.7
	No	43	7.1
	I don't know	200	33.2
Helicobacter pylori can cause duodenal ulcers	Yes	503	83.4
	No	11	1.8
	I don't know	89	14.8
Helicobacter pylori can cause stomach cancer	Yes	281	46.6
	No	50	8.3
	I don't know	272	45.1
Helicobacter pylori can cause mucosa-associated lymphoid tissue (MALT)	Yes	148	24.5
	No	20	3.3
	I don't know	435	72.1

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As shown in figure (2), Helicobacter pylori, a prevalent bacterium known to inhabit the human gastric mucosa, has long been associated with a range of gastrointestinal disorders, including chronic gastritis, peptic ulcers, and, most notably, an increased risk of gastric cancer. The data presented in the figure underscores the significant impact of this pathogen, with the majority of respondents (281 individuals) acknowledging the potential causal link between H. pylori infection and the development of stomach cancer. This finding aligns with the substantial body of scientific evidence that has emerged over the past decades, highlighting the pivotal role of this bacterium in the pathogenesis of gastric malignancies. However, it is important to note that the relationship between H. pylori and cancer is multifaceted, and other factors, such as host genetic predisposition, environmental influences, and the complex interplay between the bacterium and the host's immune system, also play crucial roles in determining the ultimate clinical outcome. The sizable number of respondents (272) who expressed uncertainty regarding the association further emphasizes the need for continued research, public awareness campaigns, and comprehensive clinical guidelines to enhance our understanding and management of this significant public health concern.

Figure (2): Illustrates whether the participants believe that Helicobacter pylori can cause stomach cancer.

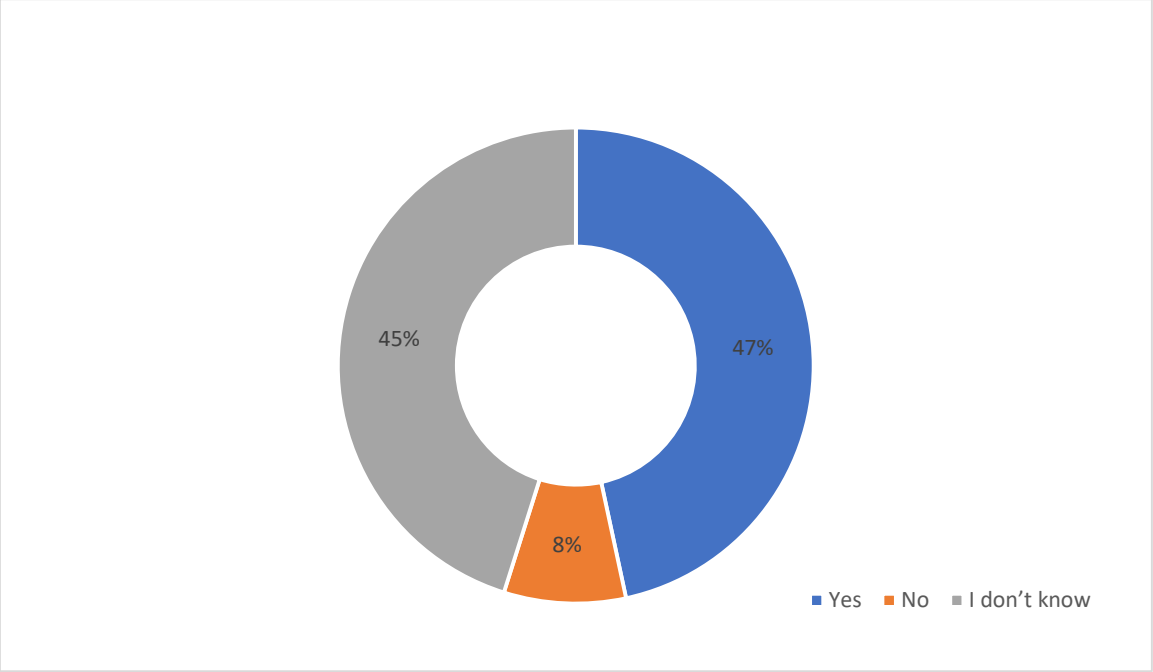

Table (4) presents the participants' knowledge regarding the risk factors associated with Helicobacter pylori (H. pylori) infection. The data highlights the varying levels of understanding among the respondents, with the majority exhibiting strong agreement or agreement on several key risk factors. The table indicates that a significant proportion of the participants (63.5% and 18.1%) strongly agree and agree, respectively, that alcohol consumption is a risk factor for stomach cancer. Similarly, a majority (56.7% and 20.6%) strongly agree and agree that smoking, including both cigarettes and

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shisha, is a risk factor. This suggests a fairly robust understanding among the participants regarding the link between these lifestyle factors and the development of stomach cancer. Furthermore, the data shows that the participants have a strong grasp of the role of family history and past medical history of gastric cancer as risk factors, with over 50% of respondents strongly agreeing and an additional 25% agreeing on these factors. This highlights the participants' awareness of the genetic and personal medical history components in the risk assessment for stomach cancer. However, the responses on certain risk factors, such as the consumption of smoked food, atrophic gastritis, and a salty diet, exhibit a more neutral or mixed understanding, with a significant proportion of respondents remaining neutral or disagreeing on these factors. This suggests a need for further education and awareness-raising efforts to ensure a more comprehensive understanding of the various risk factors associated with H. pylori infection and stomach cancer among the study population. Overall, the findings provide valuable insights into the participants' knowledge and perceptions regarding the risk factors for H. pylori infection and stomach cancer. This information can be leveraged to tailor educational interventions and public health initiatives aimed at enhancing the community's understanding and awareness of the key risk factors, ultimately contributing to better preventive and management strategies for this significant public health concern.

Table (4): Participants' knowledge towards risk factors of H. Pylori infection (n=603).

Parameter	***Strongly agree***	***Agree***	***Neutral***	***Disagree***	***Strongly Disagree***
Alcohol consumption is a risk factor for stomach cancer	383 63.5%	109 18.1%	69 11.4%	32 5.3%	10 1.7%
Smoking "cigarettes or Shisha" is a risk factor for stomach cancer	342 56.7%	124 20.6%	77 12.8%	48 8.0%	12 2.0%
Family history of gastric cancer is a risk factor for stomach cancer	307 50.9%	156 25.9%	77 12.8%	49 8.1%	14 2.3%
Past medical history of gastric cancer is a risk factor for stomach cancer	334 55.4%	138 22.9%	82 13.6%	40 6.6%	9 1.5%
Stomach ulcer is a risk factor for stomach cancer	292 48.4%	142 23.5%	118 19.6%	42 7.0%	9 1.5%
Consumption of smoked food is a risk factor for stomach cancer	178 29.5%	96 15.9%	207 34.3%	101 16.7%	21 3.5%
Atrophic gastritis is a risk factor for stomach cancer	187 31.0%	86 14.3%	238 39.5%	74 12.3%	18 3.0%
Irregular unhealthy diet is a risk factor for stomach cancer	202 33.5%	134 22.2%	148 24.5%	93 15.4%	26 4.3%
Older age is a risk factor for stomach cancer	147 24.4%	98 16.3%	180 29.9%	143 23.7%	35 5.8%
H. Pylori Infection is a risk factor for stomach cancer	288 47.8%	132 21.9%	130 21.6%	39 6.5%	14 2.3%

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Stress and anxiety is a risk factor for stomach cancer	199 33.0%	125 20.7%	183 30.3%	80 13.3%	16 2.7%
A salty diet is a risk factor for stomach cancer	127 21.1%	94 15.6%	226 37.5%	126 20.9%	30 5.0%
Consumption of pickled food is a risk factor for stomach cancer	151 25.0%	87 14.4%	199 33.0%	136 22.6%	30 5.0%
Male sex is a risk factor for stomach cancer	134 22.2%	55 9.1%	213 35.3%	157 26.0%	44 7.3%
Frequent eating of leftovers is a risk factor for stomach cancer	148 24.5%	82 13.6%	191 31.7%	135 22.4%	47 7.8%
Frequent midnight snacking is a risk factor for stomach cancer	120 19.9%	75 12.4%	184 30.5%	157 26.0%	67 11.1%

The data presented in table (5) provides valuable insights into the participants' awareness and attitudes towards Helicobacter pylori (H. pylori) infection. The findings suggest that the majority of the respondents have a good understanding of the common symptoms associated with stomach cancer, such as gastrointestinal bleeding, abdominal lump, weight loss, recurrent nausea and vomiting, abdominal pain, and abdominal fullness. Over 50% of the participants strongly agreed that these symptoms are indicative of stomach cancer, indicating a high level of awareness. Furthermore, the data reveals that a significant proportion of the participants (88.2%) maintain clean food and water intake as a daily habit to prevent H. pylori infection, and a substantial number (64.7%) also emphasize the importance of enhancing personal hygiene. These preventive measures demonstrate a proactive approach to addressing the risk of H. pylori infection. Regarding the participants' beliefs about specific transmission routes, the majority strongly agreed that hand washing after using the toilet (70.5%) and before eating (68.7%) can protect against H. pylori infection. However, there was a more mixed response regarding the association between consuming raw vegetables and fruits (34.3% strongly agreed, 18.9% agreed) and the risk of H. pylori infection, suggesting a need for further education and clarification on this topic. The data also highlights the participants' awareness of the potential role of contaminated water sources, such as well water (40.5% strongly agreed, 21.6% agreed), in the transmission of H. pylori. This understanding is crucial for implementing effective preventive strategies, particularly in areas where access to safe drinking water may be a challenge. Overall, the survey results indicate a generally high level of awareness and positive attitudes towards the prevention and control of H. pylori infection among the participants. However, the data also identifies areas where further education and awareness-raising efforts may be beneficial, such as clarifying the role of raw produce consumption in H. pylori transmission. Continued efforts to promote comprehensive understanding and effective preventive practices can contribute to the overall management of H. pylori infection and its associated health risks.

Table (5): participants' awareness and attitude towards H. Pylori infection (n=603).

Parameter		***No.***	***Percent (%)***
Gastrointestinal bleeding is a symptom for stomach cancer	Strongly agree	254	42.1
	Agree	132	21.9

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	Neutral	158	26.2
	Disagree	52	8.6
	Strongly disagree	7	1.2
Abdominal lump is a symptom for stomach cancer	Strongly agree	245	40.6
	Agree	151	25.0
	Neutral	155	25.7
	Disagree	44	7.3
	Strongly disagree	8	1.3
Weight loss is a symptom for stomach cancer	Strongly agree	286	47.4
	Agree	128	21.2
	Neutral	122	20.2
	Disagree	58	9.6
	Strongly disagree	9	1.5
Recurrent nausea and vomiting is a symptom for stomach cancer	Strongly agree	310	51.4
	Agree	144	23.9
	Neutral	109	18.1
	Disagree	31	5.1
	Strongly disagree	9	1.5
Abdominal pain is a symptom for stomach cancer	Strongly agree	322	53.4
	Agree	149	24.7
	Neutral	87	14.4
	Disagree	38	6.3
	Strongly disagree	7	1.2
Abdominal fullness is a symptom for stomach cancer	Strongly agree	306	50.7
	Agree	142	23.5
	Neutral	110	18.2
	Disagree	36	6.0
	Strongly disagree	9	1.5
Which of the following habits you practice daily to prevent getting infected with H.pylori?*	Maintain clean food and water intake	532	88.2
	Enhance personal hygiene	390	64.7
	Undergoing regular health checks	312	51.7
	Never share utensils	268	44.4
	None of the above	39	6.4
Hands washing after using the toilet protects against h. pylori infection	Strongly agree	425	70.5
	Agree	103	17.1
	Undecided	50	8.3
	Disagree	19	3.2

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	Strongly disagree	6	1.0
Hands washing before eating protects against h. pylori infection	Strongly agree	414	68.7
	Agree	120	19.9
	Undecided	51	8.5
	Disagree	13	2.2
	Strongly disagree	5	.8
Eating raw vegetables and fruits can lead to h. pylori infection	Strongly agree	207	34.3
	Agree	114	18.9
	Undecided	161	26.7
	Disagree	95	15.8
	Strongly disagree	26	4.3
Consumption of contaminated water could be a source of h. pylori infection	Strongly agree	360	59.7
	Agree	144	23.9
	Undecided	60	10.0
	Disagree	26	4.3
	Strongly disagree	13	2.2
Well water could be a source of h. pylori infection	Strongly agree	244	40.5
	Agree	130	21.6
	Undecided	157	26.0
	Disagree	53	8.8
	Strongly disagree	19	3.2

****Results may overlap***

The provided data in table (6) offers valuable insights into the knowledge and awareness levels regarding H. pylori among the surveyed population. The results indicate that a majority of the respondents (51.6%) possess a low level of knowledge about this common gastric pathogen, which is concerning given its significant health implications. While a sizeable portion (37.8%) exhibits a moderate level of understanding, the relatively small percentage (10.6%) with a high level of knowledge and awareness suggests a need for increased educational efforts and public awareness campaigns. Enhancing the general population's familiarity with H. pylori, its risk factors, symptoms, and appropriate diagnostic and treatment approaches, could contribute to earlier detection, more effective management, and improved patient outcomes. This data underscores the importance of implementing comprehensive strategies to improve the overall knowledge and awareness surrounding H. pylori, thereby empowering individuals to make informed decisions about their gastrointestinal health.

Table (6): Shows knowledge and awareness about H.Pylori score results.

	Frequency	**Percent**
High level of knowledge and awareness	64	10.6
Moderate level of knowledge	228	37.8
Low level of knowledge	311	51.6
Total	603	100.0

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Based on the provided data in Table 7, it appears that the respondents have varied attitudes and behaviors regarding their H. pylori score results. The majority of the participants, 47.4%, exhibited a neutral attitude, which may suggest a level of indifference or uncertainty towards the implications of their test results. Conversely, a significant proportion, 33.2%, demonstrated a positive attitude, potentially indicating a willingness to address any underlying H. pylori-related health concerns or a sense of relief upon receiving favorable test results. Notably, 19.4% of the respondents exhibited a negative attitude, which could be attributed to a range of factors, such as concerns about their health, the perceived severity of the condition, or a reluctance to engage with the necessary treatment or management protocols. These findings underscore the importance of tailored communication and support strategies to ensure that individuals receive appropriate guidance and resources to effectively manage their H. pylori-related health outcomes, as the varied attitudinal responses observed may have implications for treatment adherence and overall disease management.

Table (7): Shows attitude and behavior about H.Pylori score results.

	Frequency	**Percent**
Positive Attitude	200	33.2
Neutral attitude	286	47.4
Negative attitude	117	19.4
Total	603	100.0

Table (8) shows that knowledge and awareness level has statistically significant relation to age (p value=0.0001), region of residence (p value=0.0001), participant's previous infection with H. pylori (p value=0.009), whether a family member had been infected with H. pylori (p value=0.008) and source of information regarding H. Pylori (p value=0.001). It also shows statistically insignificant relation to gender, marital status, place of residence and occupation.

Table (8): Relation between knowledge level and sociodemographic characteristics.

Parameters		***Knowledge and awareness level***		***Total (N=603)***	***P value****
		High or moderate level	**Low level**		
Gender	Female	168	176	344	0.815
		57.5%	56.6%	57.0%	
	Male	124	135	259	
		42.5%	43.4%	43.0%	
Age	21 or less	47	100	147	0.0001
		16.1%	32.2%	24.4%	
	21 to 25	88	56	144	
		30.1%	18.0%	23.9%	
	25 to 50	96	80	176	

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		32.9%	25.7%	29.2%	
	more than 50	61	75	136	
		20.9%	24.1%	22.6%	
Marital status	Single	152	163	315	0.404
		52.1%	52.4%	52.2%	
	Married	125	140	265	
		42.8%	45.0%	43.9%	
	Divorced	10	6	16	
		3.4%	1.9%	2.7%	
	Widowed	5	2	7	
		1.7%	0.6%	1.2%	
Place of residence	Village	15	22	37	0.322
		5.1%	7.1%	6.1%	
	City	277	289	566	
		94.9%	92.9%	93.9%	
Region of residence	Northern region	7	7	14	0.0001
		2.4%	2.3%	2.3%	
	Southern region	44	39	83	
		15.1%	12.5%	13.8%	
	Central region	112	75	187	
		38.4%	24.1%	31.0%	
	Eastern region	26	18	44	
		8.9%	5.8%	7.3%	
	Western region	103	172	275	
		35.3%	55.3%	45.6%	
Education level	Primary School	7	0	7	N/A
		2.4%	0.0%	1.2%	
	Middle School	2	18	20	
		0.7%	5.8%	3.3%	
	High School	65	82	147	
		22.3%	26.4%	24.4%	
	Diploma	18	26	44	
		6.2%	8.4%	7.3%	
	Bachelor's degree	159	141	300	
		54.5%	45.3%	49.8%	
	Postgraduate degree	41	42	83	
		14.0%	13.5%	13.8%	
	Illiterate	0	2	2	
		0.0%	0.6%	0.3%	

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Occupation	Student	112	127	239	0.322
		38.4%	40.8%	39.6%	
	Medical field	1	1	2	
		0.3%	0.3%	0.3%	
	Non-medical field	1	1	2	
		0.3%	0.3%	0.3%	
	Employee	92	72	164	
		31.5%	23.2%	27.2%	
	Retired	42	51	93	
		14.4%	16.4%	15.4%	
	Unoccupied	44	59	103	
		15.1%	19.0%	17.1%	
Have you ever experienced an infection with Helicobacter pylori?	No	224	265	489	0.008
		76.7%	85.2%	81.1%	
	Yes	68	46	114	
		23.3%	14.8%	18.9%	
Has anyone in your family ever had an illness with Helicobacter pylori?	No	140	182	322	0.009
		47.9%	58.5%	53.4%	
	Yes	152	129	281	
		52.1%	41.5%	46.6%	
From where did you learn about Helicobacter pylori? the study)	Medical sources	123	87	210	0.001
		42.1%	28.0%	34.8%	
	Non-medical sources	148	186	334	
		50.7%	59.8%	55.4%	
	Others	21	38	59	
		7.2%	12.2%	9.8%	

****P value was considered significant if ≤ 0.05.***

Table (9) shows that attitude and behavior level has statistically significant relation to region of residence (p value=0.031), education level (p value=0.032), whether any family participant had been infected with the disease (p value=0.017) and the source of information regarding the disease (p value=0.001). It also shows statistically insignificant relation to gender, age, marital status, place of residence and if the participant experienced an infection with the disease before.

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Table (9): Attitude and behavior level in association with sociodemographic characteristics.

Parameters		***Attitude and behavior level***		***Total (N=603)***	***P value****
		Neutral or Negative attitude	**Positive attitude**		
Gender	Female	237	107	344	0.215
		58.8%	53.5%	57.0%	
	Male	166	93	259	
		41.2%	46.5%	43.0%	
Age	21 or less	107	40	147	0.226
		26.6%	20.0%	24.4%	
	21 to 25	95	49	144	
		23.6%	24.5%	23.9%	
	25 to 50	109	67	176	
		27.0%	33.5%	29.2%	
	more than 50	92	44	136	
		22.8%	22.0%	22.6%	
Marital status	Single	214	101	315	0.910
		53.1%	50.5%	52.2%	
	Married	174	91	265	
		43.2%	45.5%	43.9%	
	Divorced	10	6	16	
		2.5%	3.0%	2.7%	
	Widowed	5	2	7	
		1.2%	1.0%	1.2%	
Place of residence	Village	25	12	37	0.922
		6.2%	6.0%	6.1%	
	City	378	188	566	
		93.8%	94.0%	93.9%	
Region of residence	Northern region	12	2	14	0.031
		3.0%	1.0%	2.3%	
	Southern region	57	26	83	
		14.1%	13.0%	13.8%	
	Central region	109	78	187	
		27.0%	39.0%	31.0%	
	Eastern region	30	14	44	
		7.4%	7.0%	7.3%	
	Western region	195	80	275	
		48.4%	40.0%	45.6%	

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Education level	Primary School	1	6	7	0.032
		0.2%	3.0%	1.2%	
	Middle School	16	4	20	
		4.0%	2.0%	3.3%	
	High School	100	47	147	
		24.8%	23.5%	24.4%	
	Diploma	26	18	44	
		6.5%	9.0%	7.3%	
	Bachelor's degree	198	102	300	
		49.1%	51.0%	49.8%	
	Postgraduate degree	60	23	83	
		14.9%	11.5%	13.8%	
	Illiterate	2	0	2	
		0.5%	0.0%	0.3%	
Occupation	Student	173	66	239	N/A
		42.9%	33.0%	39.6%	
	Medical field	2	0	2	
		0.5%	0.0%	0.3%	
	Non-medical field	1	1	2	
		0.2%	0.5%	0.3%	
	Employee	103	61	164	
		25.6%	30.5%	27.2%	
	Retired	60	33	93	
		14.9%	16.5%	15.4%	
	Unoccupied	64	39	103	
		15.9%	19.5%	17.1%	
Have you ever experienced an infection with Helicobacter pylori?	No	329	160	489	0.629
		81.6%	80.0%	81.1%	
	Yes	74	40	114	
		18.4%	20.0%	18.9%	
Has anyone in your family ever had an illness with Helicobacter pylori?	No	229	93	322	0.017
		56.8%	46.5%	53.4%	
	Yes	174	107	281	
		43.2%	53.5%	46.6%	
From where did you learn about Helicobacter pylori? the study)	Medical sources	155	55	210	0.001
		38.5%	27.5%	34.8%	
	Non-medical sources	202	132	334	
		50.1%	66.0%	55.4%	
	Others	46	13	59	

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		11.4%	6.5%	9.8%	

P value was considered significant if ≤ 0.05.

Discussion:

Helicobacter pylori (H. pylori) are human pathogens transmitted from human to human through oral routes and cause chronic gastritis in all colonized subjects [10]. This gram-negative bacterium is a common infectious pathogen that inhabits the gastric mucosa in around 40–50% of the world's population, leading to a global public health issue. In Saudi Arabia, the incidence of H. pylori was estimated to be 50–80% among symptomatic patients with dyspepsia, stomach pain, or patients undergoing endoscopic procedures [11]. (H. pylori) can lead to serious complications such as peptic ulcer, which may result in hemorrhage. It can also cause gastric cancer, the third leading cancer-related death and the fifth most common cancer worldwide [12]. Knowledge about screening and prevention among risk groups, early diagnosis, and treatment may prompt people to seek measures to prevent the infection. Globally, knowledge and awareness are inadequate regarding H. pylori infection among the general population. Thus, we aimed in this study to assess Knowledge and Awareness level of Saudi population regarding Helicobacter Pylori induced gastric ulcer and cancer.

As regard knowledge and awareness score about H.Pylori, we have found that a majority of the respondents (51.6%) possess a low level of knowledge about this common gastric pathogen. While a sizeable portion (37.8%) exhibits a moderate level of understanding and a relatively small percentage (10.6%) with a high level of knowledge and awareness. Regarding the attitude score about H.Pylori, 47.4%, exhibited a neutral attitude. Conversely, a significant proportion, 33.2%, demonstrated a positive attitude, potentially indicating a willingness to address any underlying H. pylori-related health concerns or a sense of relief upon receiving favorable test results. Notably, 19.4% of the respondents exhibited a negative attitude. On the other hand, a study conducted by Nader Alaridah et.al (2023) [13] revealed that around half of the participants were aware that persistent H. pylori infection may lead to gastric and duodenal ulcers and gastric cancer. This study showed better awareness compared to previous studies conducted in China, and the United Arab Emirates [14,15] and is quite similar to a research done in Korea [16]. Locally, in Saudi Arabia, a study was conducted at King Saud University, Riyadh, to compare the *H. pylori* knowledge regarding the gastric complications between health science and non-health science college students. In both the two undergraduate groups, less than 10% had good knowledge [17]. Additionally, a study conducted by Almadi et al. (2013) [18] aimed to assess the knowledge and awareness level of the general population of Saudi Arabia regarding Helicobacter pylori-induced gastric ulcers and cancer. The study surveyed 1000 individuals from various regions of Saudi Arabia and found that only 34% of the participants were aware of H. pylori as a risk factor for gastric ulcers and cancer. Furthermore, only 22% of the participants recognized that H. pylori infection can be asymptomatic. Another study by Al Jumah et al. (2018) [19] found that only 28% of the participants were aware of the association between H. pylori infection and gastric ulcers and cancer. Moreover, the study reported that 65% of the participants believed that stress and spicy food were the main causes of gastric ulcers, showing a misconception among the general population regarding the etiology of these diseases. Another study by Brown and colleagues (2019) [20] investigated the knowledge and awareness level of the general population regarding H. pylori-induced gastric ulcers and

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cancer risk factors. The study involved 1500 participants and reported that 45% of the respondents had heard of H. pylori but did not know its relationship with gastric ulcers or cancer. Additionally, only 10% of the participants were aware of the potential risk factors for H. pylori infection, such as contaminated water and unsanitary living conditions. In another study by Chen et al. (2019) [21], a higher level of knowledge and awareness regarding H. pylori-induced gastric ulcers and cancer was observed among participants. The study reported that 60% of the participants were knowledgeable about the relationship between H. pylori infection and gastric ulcers, and 45% were aware of the link with gastric cancer. Additionally, the average score on the knowledge assessment quiz among participants was 70%, indicating a moderate level of understanding.

Regarding the relation between knowledge level and sociodemographic characteristics, we have found a statistically significant relation to age (p value=0.0001), region of residence (p value=0.0001), participant's previous infection with H. pylori (p value=0.009), whether a family member had been infected with H. pylori (p value=0.008) and source of information regarding H. Pylori (p value=0.001). It also shows statistically insignificant relation to gender, marital status, place of residence and occupation. On the other hand, a study conducted by Kim et al. (2018) [22] in South Korea, revealed a significant association between knowledge level and age ($p < 0.05$), with older participants demonstrating a higher level of awareness about H. pylori and its association with gastric cancer. Interestingly, no significant correlation was found between knowledge level and gender or education level ($p > 0.05$). Another study by Garcia et al. (2020) [23] explored the relationship between sociodemographic characteristics and knowledge of H. pylori-induced gastric cancer among 300 participants in Brazil. The findings showed a statistically significant association between knowledge level and education level ($p = 0.01$), with individuals with higher education demonstrating a greater understanding of the link between H. pylori and gastric cancer. However, no significant correlations were observed between knowledge level and age or gender ($p > 0.05$).

Conclusion:

In conclusion, the study conducted in Saudi Arabia revealed a concerning lack of knowledge and awareness among the general population regarding Helicobacter pylori-induced gastric ulcers and cancer. A majority of respondents showed a low level of understanding about this common gastric pathogen, highlighting the need for increased education and public awareness campaigns. While some individuals exhibited a moderate or high level of knowledge, a significant portion demonstrated a neutral or negative attitude towards H. pylori. The study also identified significant variations in awareness based on age, region of residence, previous infection with H. pylori, family history of infection, and the source of information. These findings underscore the importance of targeted educational initiatives to improve knowledge about H. pylori and its associated health risks, encouraging early detection, prevention, and intervention to mitigate the impact of this prevalent bacterium on gastric health.

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Ethical approval

Ethical approval was obtained from the research ethics committee of Ministry of Health with Application number: [A01918]. An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

Written informed consent was obtained from all individual participants included in the study.

Data and materials availability

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

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