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NUTRITIONAL ASSESSMENT AND ASSOCIATED FACTORS IN HELICOBACTER PYLORI INFECTED PATIENTS OF DISTRICT MARDAN

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Abstract

Helicobacter pylori infection affects nearly half of the global population and remains a major public health concern, particularly in developing countries such as Pakistan, where infection rates remain high despite global declines associated with improved living standards. The present study aimed to assess the nutritional intake and dietary patterns of H. pylori infected patients attending Mardan Medical Complex Hospital of District Mardan. A cross-sectional study design was employed, and data was collected between April and June 2022. A total of 200 male and female patients diagnosed with H. pylori infection were enrolled using a structured questionnaire. Information regarding sociodemographic characteristics, anthropometric measurements (height, weight, and body mass index), physical activity, and dietary intake was collected through Food Frequency Questionnaire (FFQ). The collected data was analyzed using Microsoft Excel. The results revealed a significant association between H. pylori infection and the frequent consumption of fast foods, fried and spicy foods, bakery items, carbonated beverages, tea, and dairy products. A higher intake of carbohydrate-rich diets and a preference for fast food were strongly associated with increased susceptibility to H. pylori infection. Additionally, sedentary lifestyle patterns and elevated BMI were observed to contribute to a higher risk of infection. In contrast, diets rich in fruits, vegetables, and mutton demonstrated a negative association with H. pylori infection, suggesting a potential protective role. The study concludes that unhealthy dietary habits, particularly excessive intake of fast foods and refined carbohydrates, along with physical inactivity, are key contributors to H. pylori infection. Nutritional modification, maintenance of normal BMI, increased physical activity, and greater consumption of fruits and vegetables may help reduce the burden of H. pylori infection.

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INTRODUCTION

Helicobacter pylori (*H. pylori*) is one of the most common chronic bacterial infections affecting humans worldwide and represents a major global public health concern [1]. In 1982, Barry Marshall and Robin Warren successfully isolated *H. pylori* from the human stomach, and in 1984 they demonstrated its strong association with chronic gastritis and peptic ulcer disease, a discovery that fundamentally changed the understanding of gastric pathology and earned them international recognition [2]. The bacterium was officially named *Helicobacter pylori* in 1989 due to its characteristic helical morphology and its predilection for colonizing the pyloric region of the stomach [3].

H. pylori is a Gram-negative, spiral-shaped, flagellated, microaerophilic bacterium capable of surviving in the harsh acidic environment of the stomach. It exhibits both anaerobic and aerobic metabolic characteristics and typically measures approximately 2-4 µm in length and 0.5-1 µm in width [4]. Its ability to persistently colonize the gastric mucosa is attributed to several virulence factors, including urease production, motility, and adherence to gastric epithelial cells. Once established, *H. pylori* infection often becomes chronic and can persist for decades if left untreated [5].

Globally, it is estimated that approximately 50% of the world's population is infected with *H. pylori*, making it one of the most prevalent human infections[6]. Despite its widespread distribution, the prevalence of *H. pylori* infection varies considerably across regions and populations. In many developed countries, infection rates have declined substantially over recent decades due to improved sanitation, better living standards, access to clean water, and widespread use of antibiotics. In contrast, *H. pylori* infection remains highly prevalent in developing countries, where poor socioeconomic conditions, overcrowding, inadequate hygiene, and limited access to healthcare contribute to sustained transmission[7].

Studies from Africa consistently report high prevalence rates of *H. pylori* infection. For example, prevalence rates of 81.7% in Nigeria, 53.0% in Egypt, 39.1% in Tanzania, 64.39% in Cameroon, and 73.3% among children and 54.8% among adults in Kenya have been documented [8]. Similarly, in many developing Asian countries such as Pakistan, India, Thailand, and Bangladesh, the incidence of *H. pylori* infection remains high, whereas developed Asian countries such as China and Japan have shown a decline in prevalence over time, particularly in earlier eras [9]. Within Pakistan, regional variations have been reported. For instance, the prevalence of *H. pylori* infection in Timergara city was reported to be 22.1%, which is lower than the 34.2% prevalence previously reported in Swat [10]. These findings highlight the influence of geographic, socioeconomic, and environmental factors on the epidemiology of *H. pylori* infection.

Clinically, *H. pylori* is recognized as one of the most consequential human pathogens due to its strong association with a wide range of gastrointestinal and extra-gastrointestinal diseases. The bacterium is a major etiological agent of chronic gastritis, peptic ulcer disease, and gastric adenocarcinoma, and it is also implicated in the development of mucosa-associated lymphoid tissue (MALT) lymphoma [6, 11]. Chronic infection with *H. pylori* induces a persistent inflammatory response in the gastric mucosa, which can progress to atrophic gastritis, intestinal metaplasia, dysplasia, and ultimately gastric cancer. Gastric cancer associated with *H. pylori* infection represents a significant global burden, as it is the fifth most common cancer worldwide and the third leading cause of cancer-related mortality[12] [3].

In addition to its well-established role in gastrointestinal disorders, *H. pylori* infection has been linked to several non-gastrointestinal conditions. These include iron deficiency anemia, vitamin B12 deficiency, idiopathic thrombocytopenic purpura, and growth retardation in children [13]. In developing countries, *H. pylori* infection is considered an important contributing factor to malnutrition, particularly among children, due to impaired nutrient absorption, chronic inflammation, and increased susceptibility to enteric infections [14].

Despite its pathogenic potential, *H. pylori* infection is often asymptomatic. It has been reported that more than 80% of infected individuals do not exhibit overt clinical symptoms[15] (Abdelghani et al., 2017). When symptoms do occur, they commonly include

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epigastric pain, dyspepsia, nausea, vomiting, bloating, and acid reflux, all of which can significantly impair a patient's quality of life (QOL) [16]. Certain dietary habits, particularly the consumption of spicy foods, have been shown to exacerbate dyspeptic symptoms in individuals infected with *H. pylori* [9]. At the molecular level, during colonization of the gastric epithelium, *H. pylori* activates oxidant-sensitive transcription factors, leading to oxidative stress and tissue damage, which further contributes to disease progression [5, 17].

The exact mode of transmission of *H. pylori* remains unclear; however, evidence suggests that the oral-fecal route is the most likely pathway [18]. Transmission may occur directly from person to person or indirectly through contaminated food, water, or environmental sources. In developed countries, direct person-to-person transmission is believed to be the primary mode, whereas in developing countries, food- and waterborne transmission plays a more prominent role due to poor sanitation and hygiene[19]. Oral-oral and gastro-oral transmission via saliva, vomitus, and respiratory droplets have also been proposed. Mothers are considered an important source of transmission to children, particularly in early life [20].

In recent years, increasing attention has been directed toward the role of nutrition and dietary factors in the development, progression, and outcomes of *H. pylori* infection.[21] Diet not only influences the gastric environment but may also modulate bacterial colonization, host immune responses, and disease severity. Several dietary components possess antibacterial properties that may reduce the ability of *H. pylori* to colonize the gastric mucosa. Conversely, certain dietary patterns may promote infection and exacerbate disease outcomes[22].

High salt intake, for example, has been shown to facilitate *H. pylori* colonization by disrupting the integrity and viscosity of the gastric mucosal barrier and inducing an inflammatory state [23]. Similarly, diets rich in refined carbohydrates, fast foods, bakery items, and sweets have been positively associated with the incidence of *H. pylori* infection [24]. On the other hand, low consumption of fruits and vegetables has been identified as one of the most significant risk factors for *H. pylori* infection [25].

A growing body of epidemiological evidence supports the association between dietary patterns, nutritional status, and *H. pylori* infection. Shah et al. (2022) conducted a cross-sectional study in district Khairpur, Pakistan, involving 238 individuals who consumed spicy foods. The study found that 158 participants tested positive for *H. pylori*, indicating a direct association between spicy food intake and infection [9]. Similarly, Al-Badaii et al. (2021) reported a high prevalence of *H. pylori* among school children in Dhamar, Yemen, particularly among those consuming diets rich in sandwiches, crisps, and fried foods [26].

Studies from different regions have also highlighted the protective role of a balanced diet. Öztekin et al. (2021) demonstrated that adequate intake of fruits and vegetables and reduced consumption of processed salty foods were associated with lower prevalence and better outcomes of *H. pylori* infection [22]. Fuller and Darian (2018) reported similar findings among adults of the Navajo Nation, where higher vegetable consumption was associated with a lower tendency to develop *H. pylori* infection [27].

Socioeconomic status and nutritional deficiencies further compound the risk of infection. Mehata et al. (2021), using data from the Nepal National Micronutrient Survey, found that poor socioeconomic conditions, overcrowding, and micronutrient deficiencies were significantly associated with *H. pylori* infection among children, adolescents, and non-pregnant females [28]. While several studies have established clear links between diet and *H. pylori* infection, findings are not always consistent. For instance, Assaad et al. reported no significant association between general dietary habits and *H. pylori* infection, although they identified other contributing factors such as smoking, cohabitation with infected individuals, and consumption of meals outside the home [29]. These inconsistencies highlight the complex interaction between dietary, environmental, and host-related factors in *H. pylori* infection.

Taken together, existing evidence suggests that *H. pylori* infection is influenced not only by microbial and environmental factors but also by nutritional

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status and dietary habits. Given the high prevalence of *H. pylori* infection in developing countries like Pakistan and its strong association with gastrointestinal diseases, malnutrition, and reduced quality of life, there is a critical need to further investigate the relationship between diet, nutritional status, and *H. pylori*-related symptoms. Understanding these associations may contribute to the development of effective dietary interventions aimed at reducing infection burden, improving patient outcomes, and enhancing overall public health tis study was conducted with the objective to assess the nutritional status of *H. pylori* infected patients and determine the relationship between dietary intake and *H. pylori* associated symptoms.

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional study was conducted at a government hospital, Mardan Medical Complex, located in District Mardan. Prior to data collection, formal approval was obtained from the Medical Superintendent of the hospital as well as from the Ethical Committee of the Women University Mardan.

Study Population and Sample Size

The study included a total sample size of 200 participants, which was collected randomly over a three-month period from April 2022 to June 2022. Both male and female patients belonging to different age groups were included in the study. Participants were selected from patients visiting the hospital who had already been diagnosed with *Helicobacter pylori* infection through a blood test.

Data Collection Tool

Data were collected using a specially designed, structured questionnaire administered through face-to-face interviews. The questionnaire was developed to obtain comprehensive information regarding participants' demographic characteristics, anthropometric measurements, clinical signs and symptoms, and dietary intake.

Anthropometric Assessment

Anthropometric data included measurements of body weight and height, which were obtained using standard procedures. Body weight was measured to the nearest 0.1 kg using a calibrated weighing scale, with participants wearing light clothing and no shoes. Height was measured using a standard measuring scale. Body mass index (BMI) was calculated according to the World Health Organization (WHO) criteria using the formula: weight in kilograms divided by height in meters squared (kg/m²). Based on BMI values, participants were categorized into underweight, normal weight, overweight, and obese groups, as shown in Table 1.

Table 1. BMI GROUPS BY WHO

CATEGORIES	BMI GROUPS
Under weight	<18kg/m^2
Normal	18.5–24.9 Kg/m2
Over weight	25.0–29.9 Kg/m^2
Obese	>30Kg/m^2

Source:*(World Health Organization [WHO], 1998)*

Dietary Assessment

Dietary intake data were collected using a Food Frequency Questionnaire (FFQ). The FFQ was incorporated into the structured questionnaire to assess the habitual dietary patterns and nutritional intake of the participants.

Statistical Analysis

The collected data were coded and entered into Statistical Package for the Social Sciences (SPSS) software for analysis. Descriptive statistics, including frequencies and percentages, were used to summarize the data and present the findings of the study

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RESULTS AND DISCUSSION

The present study analyzed demographic characteristics, anthropometric status, lifestyle factors, clinical symptoms, and dietary intake among 200 *H. pylori*–infected patients attending Mardan Medical Complex.

Demographic Characteristics, BMI, and Physical Activity

Gender-wise distribution showed that out of 200 respondents, 90 (45%) were male and 110 (55%) were female, indicating a higher proportion of *H. pylori* infection among females. This finding suggests that females in the studied population may be at a comparatively higher risk of *H. pylori* infection. Similar findings were reported by Omosor et al. (2017), who observed that 70.6% of infected individuals were female, whereas males constituted 29.4% of the cases. In contrast, Božić et al. (2021) reported a higher prevalence among males (59%) compared to females (42%), while Almugadam et al. (2021) also documented male predominance (51.5%) among *H. pylori* patients. These variations may be attributed to differences in lifestyle, dietary habits, healthcare access, and population characteristics across regions.

Assessment of body mass index (BMI) revealed that only 24 (12%) respondents were in the normal BMI category, whereas 76 (38%) were overweight and 100 (50%) were obese. The findings indicate that the majority of *H. pylori*–infected patients belonged to overweight and obese categories. These results are in agreement with the findings of Siddiqui et al. (2018), who reported a higher prevalence of *H. pylori* infection among obese individuals (76%) compared to those with a healthy BMI (24%). Increased BMI may influence gastric physiology and inflammatory responses, thereby facilitating *H. pylori* colonization.

Regarding physical activity, 53 (26.5%) respondents were sedentary, 123 (61.5%) were moderately active, and 24 (12%) were extremely active. The predominance of moderate physical activity among the patients suggests that physical inactivity may not be the sole determinant of infection; however, sedentary behavior combined with other risk factors such as poor diet and increased BMI may contribute to disease burden (Table 2

Table 2. Gender, BMI and Physical activity of the respondents

Groups		Frequency(n=200)	Percentage (%)
GENDER	Male	90	45%
	Female	110	55%
BMI	Normal	24	12%
	Over weight	76	38%
	Obese	100	50%
PHYSICAL ACTIVITY	Sedentary	53	26.5%
	Moderate	123	61.5%
	Extreme	24	12%

Lifestyle Factors: Sleeping Pattern, Family History, and Stress

Analysis of sleeping patterns showed that 14 (7%) respondents went to bed within 15 minutes after eating, 31 (15.5%) after one hour, 85 (42.5%) after two hours, and 70 (35%) after three hours. The majority of respondents reported going to bed two to three hours after meals, as presented in Table 3.

Family history assessment revealed that 94 (47%) respondents had a family history of *H. pylori* infection, while 106 (53%) reported no family history. This indicates that although familial clustering exists, a large proportion of cases occurred independently of reported family history.

Stress levels among respondents showed that 59 (29.5%) were slightly stressed, 53 (21.5%) were very stressed, and 88 (44%) were extremely stressed. These findings suggest that psychological stress may play a contributory role in the manifestation or severity of *H. pylori* infection, potentially by influencing gastric acid secretion and immune responses.

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Table 3 Sleeping pattern, Family history and stress factor of the respondents

	GROUPS	Frequency (n=200)	Percentage (%)
SLEEPING PATTERN	1/4h	14	7%
	1h	31	15.5%
	2h	85	42.5%
	3h	70	35%
FAMILY HISTORY	Yes	94	47%
	No	106	53%
STRESS FACTOR	Slightly	59	29.5%
	Very	53	21.5%
	Extreme	88	44%

Clinical Symptoms Associated with H. pylori Infection

Clinical assessment revealed that 130 (65%) respondents reported stomach problems, while 70 (35%) did not. Similarly, abdominal pain was reported by 130 (65%) respondents, whereas 70 (35%) reported no abdominal pain (Table 4). These findings confirm that gastrointestinal discomfort is a prominent feature among *H. pylori*–infected patients.

Regarding acid reflux and vomiting, 37 (18.5%) respondents experienced symptoms once daily, 92 (46%) once weekly, 46 (22%) twice weekly, and 25 (12.5%) more than twice per week. The majority of patients experienced symptoms once per week. These findings align with Bachal et al. (2022), who reported a high prevalence (94.6%) of vomiting and nausea among *H. pylori* patients, supporting the strong association between infection and upper gastrointestinal symptoms.

Table 4. Clinical Symptoms experienced by participants

Groups		Frequency (n=200)	Percentage (%)
STOMACH PROBLEM	Yes	130	65%
	No	70	35%
ACID REFLUX	1/ day	37	18.5%
	1/ week	92	46%
	2/ week	46	22%
	>2/week	25	12.5%
ABDOMINAL	Yes	130	65%
	No	70	35%

Dietary Intake Patterns

Dietary assessment revealed varied consumption patterns among respondents. Regarding fast food intake, 45 (22.5%) respondents never consumed fast food, 12 (6%) consumed it once daily, 27 (13.5%) once weekly, 17 (8.5%) twice weekly, and 29 (14.5%) once or twice per month (Table 5). These findings indicate frequent consumption of fast food among a substantial proportion of respondents, which may contribute to *H. pylori* infection.

Bakery item consumption was reported by 130 (75%) respondents, whereas 70 (35%) did not consume bakery products. This highlights a high intake of carbohydrate-rich foods among infected patients, supporting the association between refined carbohydrate consumption and *H. pylori* infection.

Fruit intake assessment showed that 70 (35%) respondents consumed fruits rarely (0–1/month), 58 (29%) once weekly, 51 (25.5%) twice weekly, and only 21 (10.5%) consumed fruits once or twice daily. These results indicate low daily fruit consumption among most patients. Consistent with Wang et al. (2016), fruit consumption demonstrated a negative association with *H. pylori*–related gastric disorders, suggesting a protective role. Vegetable intake was also low, with 100 (50%) respondents consuming vegetables rarely, 65 (32.5%) once weekly, 28 (33%) twice weekly, and only 7 (3.5%) consuming vegetables daily. This finding supports evidence from the Japan–Hawaii cancer study, which reported a

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protective role of vegetables, particularly green and yellow vegetables, against gastric cancer. Roti intake was high, with 38 (19%) consuming it once daily, 79 (39.5%) twice daily, and 83 (41.5%) more than twice daily, reflecting a carbohydrate-dominant dietary pattern. Regarding protein intake, chicken and meat consumption was most commonly reported once weekly by 74 (37%) respondents, followed by twice weekly by 53 (26.5%). Mutton intake was relatively low, with 55 (27.5%) respondents never consuming it. Carbonated beverage intake was high, with 90 (45%) respondents consuming them twice daily and 64 (32%) once daily. Tea consumption was also high, with 90 (45%) respondents consuming tea more than twice daily. High consumption of these beverages may exacerbate gastric irritation and symptoms associated with *H. pylori* infection. Egg consumption was reported once daily by 68 (34%) respondents, while dairy products were consumed once daily by 88 (44%) respondents (Table 4.8; Figure 4.8). Similar findings were reported by Assaad et al. (2018), who observed higher milk consumption among *H. pylori* positive individuals. Overall, the findings of the present study indicate that diets high in refined carbohydrates, fast food, carbonated beverages, and tea are associated with *H. pylori* infection, whereas higher intake of fruits and vegetables appears to have a protective effect. Increased consumption of spicy foods was also associated with increased risk, consistent with findings reported by Rocco and Nardone (2018), who linked capsaicin intake with increased *H. pylori* infection risk.

Table 5. Frequency and percentage of food consumed items by respondents from District Mardan.

Food item	Intake	Frequency	Percentage	Food Items	Intake	Frequency	Percentage
Fast food	Never	45	22.50%	Mutton	Never	55	27.50%
	1/ day	12	6%		1-2/day	18	9%
	1/ week	27	13.50%		1/ week	56	28%
	2/ week	17	8.50%		2/ week	31	15.50%
	1/ month	29	14.50%		2/ month	9	4.50%
Bakery item	Yes	130	75%		1/ month	31	15.50%
	No	70	35%	Carbonated beverages	Never	12	6%
Fruits	0 or	70	35		1/ day	64	32%
	1/week	58	29		2/ day	90	45%
	2/week	51	25.5		1-2/ week	34	17%
	1or2/day	21	10.5	Intake of tea	Never	12	6%
Vegetable	1/month	100	50		1/ day	64	32%
	1/week	65	32.5		2/ day	34	17%
	2/week	28	33		3/day	90	45%
	1 or 2/day	7	3.5	Egg	Never	43	21.50%
Roti	1/ day	38	19		1/ day	68	34%
	2/ days	79	39.5		1/ week	67	33.50%
	>2/ day	83	41.5		>2/ week	22	11%
chicken and meat	1/day	30	15%	Dairy products	Never	45	22.50%
	1/ week	74	37%		1/ day	88	44%
	2/ week	53	26.50%		2/ day	50	25%
	3/week	2	1%		1/ week	17	8.50%
	1/ month	27	13.50%				

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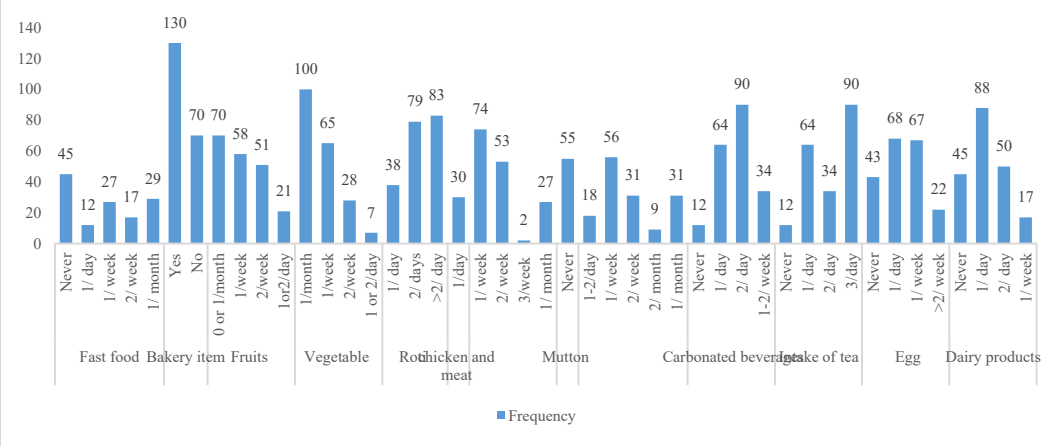


Figure 1. Frequency of consumed food items by the participants from District Mardan

CONCLUSIONS AND RECOMMENDATIONS

The present study aimed to assess the nutritional status of *H. pylori*–infected patients. The findings demonstrate that a high intake of carbohydrate-rich foods, fast foods, bakery items, carbonated beverages, and tea is associated with *H. pylori* infection. Increased BMI and sedentary or moderately active lifestyles were also common among infected individuals. In contrast, higher consumption of fruits and vegetables showed a protective association against *H. pylori* infection and its related symptoms. Based on the findings of the study, it is recommended that individuals maintain their BMI within the normal range and engage in regular physical activity. Consumption of fast food, bakery products, carbonated beverages, and excessive tea should be reduced. Increased intake of fruits and vegetables should be encouraged as part of a balanced diet to help reduce the risk and severity of *H. pylori* infection

REFERENCES

1. Hassan, M.N., et al., *88. Global prevalence of Helicobacter pylori and its effect on human health.* Pure and Applied Biology (PAB), 2020. **9**(1): p. 936-948.
2. Zahid, R., et al., *Phytotherapeutic modalities for the management of Helicobacter pylori associated peptic ulcer.* 2020, SAGE Publications Sage UK: London, England. p. 2058739220968308.
3. Öztekin, M., B. Yılmaz, D. Ağagündüz, and R. Capasso, *Overview of Helicobacter pylori infection: clinical features, treatment, and nutritional aspects.* Diseases, 2021. **9**(4): p. 66.
4. Hassan, S.T. and M. Šudomová, *The development of urease inhibitors: what opportunities exist for better treatment of Helicobacter pylori infection in children?* Children, 2017. **4**(1): p. 2.
5. Guerra-Valle, M., P. Orellana-Palma, and G. Petzold, *Plant-based polyphenols: anti-Helicobacter pylori effect and improvement of gut microbiota.* Antioxidants, 2022. **11**(1): p. 109.
6. Khodadad, A., F. Farahmand, M. Najafi, and M. Shoaran, *Probiotics for the treatment of pediatric helicobacter pylori infection: a randomized double blind clinical trial.* Iranian journal of pediatrics, 2013. **23**(1): p. 79.
7. Li, Y., et al., *Global prevalence of Helicobacter pylori infection between 1980 and 2022: a systematic review and meta-analysis.* The lancet Gastroenterology & hepatology, 2023. **8**(6): p. 553-564.
8. Namyalo, E., et al., *Prevalence of Helicobacter pylori among patients with gastrointestinal tract (GIT) symptoms: A retrospective study at selected Africa air rescue (AAR) clinics in Kampala, Uganda, from 2015 to 2019.* Journal of Tropical Medicine, 2021. **2021**(1): p. 9935142.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

9. Shar, N.A., et al., *Prevalence of Helicobacter pylori infection causing serious gastric problems in individuals consuming spicy food in district Khairpur, Pakistan.* Rawal Medical Journal, 2022. **47**(1): p. 11.
10. Shah, S.R.H., et al., *Epidemiology and risk factors of Helicobacter pylori infection in Timergara city of Pakistan: a cross-sectional study.* Clinical Epidemiology and Global Health, 2021. **12**: p. 100909.
11. Conteduca, V., et al., *H. pylori infection and gastric cancer: state of the art.* International journal of oncology, 2013. **42**(1): p. 5-18.
12. Toh, J.W. and R.B. Wilson, *Pathways of gastric carcinogenesis, Helicobacter pylori virulence and interactions with antioxidant systems, vitamin C and phytochemicals.* International journal of molecular sciences, 2020. **21**(17): p. 6451.
13. Wang, Z., H. Wang, Y. Yan, and P. Chang, *Research advances in the pathogenesis and therapeutic interventions of Helicobacter pylori and atrial fibrillation.* Frontiers in Cardiovascular Medicine, 2025. **12**: p. 1615707.
14. Nguyen, J., K. Kotilea, P. Bontems, and V.Y. Miendje Deyi, *Helicobacter pylori infections in children.* Antibiotics, 2023. **12**(9): p. 1440.
15. Elbehiry, A., et al., *Helicobacter pylori infection: current status and future prospects on diagnostic, therapeutic and control challenges.* Antibiotics, 2023. **12**(2): p. 191.
16. de Brito, B.B., et al., *Pathogenesis and clinical management of Helicobacter pylori gastric infection.* World journal of gastroenterology, 2019. **25**(37): p. 5578.
17. Kidane, D., *Molecular mechanisms of H. pylori-induced DNA double-strand breaks.* International journal of molecular sciences, 2018. **19**(10): p. 2891.
18. Duan, M., et al., *Transmission routes and patterns of helicobacter pylori.* Helicobacter, 2023. **28**(1): p. e12945.
19. Elbehiry, A., et al., *Helicobacter pylori: Routes of Infection, Antimicrobial Resistance, and Alternative Therapies as a Means to Develop Infection Control.* Diseases, 2024. **12**(12): p. 311.
20. Ali, A. and K.I. AlHussaini, *Helicobacter pylori: a contemporary perspective on pathogenesis, diagnosis and treatment strategies.* Microorganisms, 2024. **12**(1): p. 222.
21. Haley, K.P. and J.A. Gaddy, *Nutrition and Helicobacter pylori: host diet and nutritional immunity influence bacterial virulence and disease outcome.* Gastroenterology research and practice, 2016. **2016**(1): p. 3019362.
22. Rueda-Robles, A., T. Rubio-Tomás, J. Plaza-Diaz, and A.I. Álvarez-Mercado, *Impact of dietary patterns on H. pylori infection and the modulation of microbiota to counteract its effect. A narrative review.* Pathogens, 2021. **10**(7): p. 875.
23. Balendra, V., et al., *High-salt diet exacerbates H. pylori infection and increases gastric cancer risks.* Journal of Personalized Medicine, 2023. **13**(9): p. 1325.
24. Soares, G.A.S., et al., *Dietary habits and Helicobacter pylori infection: is there an association?* Therapeutic Advances in Gastroenterology, 2023. **16**: p. 17562848231160620.
25. Pete, D., et al., *A Cross-Sectional Study of Dietary Patterns and Helicobacter pylori Infection Among American Indian Adults in the Southwest.* Nutrition and Cancer, 2025. **77**(9): p. 1043-1051.
26. Al-Badaii, F., et al., *Prevalence of Helicobacter pylori infection and associated risk factors among schoolchildren at Dhamar City, Yemen.* Int J Sci Res Biol Sci, 2021. **8**(6): p. 16-22.
27. Fuller, D., *Diet Patterns and Helicobacter pylori on the Navajo Nation*. 2021, repository.arizona.edu.
28. Mehata, S., et al., *Prevalence and correlates of Helicobacter pylori infection among under-five children, adolescent and non-pregnant women in Nepal: Further analysis of Nepal national micronutrient status survey 2016.* PLoS neglected tropical diseases, 2021. **15**(6): p. e0009510.
29. Assaad, S., R. Chaaban, F. Tannous, and C. Costanian, *Dietary habits and Helicobacter pylori infection: a cross sectional study at a Lebanese hospital.* BMC gastroenterology, 2018. **18**(1): p. 48.