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Helicobacter Pylori Infection as A Risk Factor for Colorectal Cancer

Mohamed Abd Ellatif Afifi, Ahmed R. Mohamed, Mohamed A. ElAssal, Ahmed M. Hussein Dabour, Raof M. Rashed, Basem M. Abdelghafar Meghawary*, Amira K. El-Alfy

Department of Internal Medicine, Faculty of Medicine, Benha University, Egypt.

***Corresponding Author:** Basem M. Abdelghafar**, Mobile:** (+20) 01018842042, **Email:** Basemmeghawarybasem@yahoo.com

ABSTRACT

Background: Helicobacter pylori (HP) infection, traditionally associated with gastric disorders, has increasingly drawn attention for its potential role in extra-gastric pathologies. Colorectal cancer (CRC) is among the diseases under scrutiny, with emerging evidence suggesting a possible link between HP infection and CRC risk.

Objective: This study aimed to assess the correlations between H. pylori infection and colorectal cancer.

Subjects and methods: A total of 85 individuals were recruited from the Internal Medicine Department of Benha University Hospital through the period from January 2023 to July 2023 and categorized into two groups. Group 1 consisted of 50 patients with confirmed CRC following colonoscopy and histopathological examination. Group 2, the control group, included 35 individuals without CRC. Both inpatients and outpatients aged 18-70 years of both sexes.

Results: patients with CRC were older and had lower hemoglobin levels, higher leukocyte counts, and elevated urea, creatinine, and international normalized ratio (INR) compared to controls. However, there were no significant gender differences. When categorized by H. pylori stool antigen presence, no age, gender, or laboratory parameter differences emerged between those with positive and negative antigen status. Notably, multivariate analysis revealed a substantial association between H. pylori stool antigen positivity and a nearly tenfold increased risk of CRC, even after adjusting for age and gender, highlighting the potential link between H. pylori infection and CRC in this study population.

Conclusions: The present study confirmed the predictor value of positive stool antigen for H. pylori infection for development of colorectal cancer.

Keywords: Helicobacter pylori, Colorectal cancer, INR.

INTRODUCTION

Human stomach mucosa is infected with HP, a gram-negative bacterium that can lead to gastric adenocarcinoma, peptic ulcers, and chronic gastritis [1]. With an estimated 4.4 billion persons affected, HP infection has become a global issue [2]. HP infection has been recognised as a significant risk factor for gastric cancer by the International Agency for Research on Cancer since 1994 [3]. HP infection has been extensively researched in relation to stomach-related illnesses. Notably, HP infection can have a systemic impact on other organs due to its protracted stomach inflammation. Studies on HP's involvement in the pathophysiology of extragastric lesions have been extensively publicised, particularly in the last several years [4].

It has been shown that people who test positive for HP have a higher chance of developing a number of illnesses, such as autoimmune disorders, digestive, neurological, extra-gastroduodenal, cardiovascular, and pulmonary conditions. For instance, new research indicates that HP may have a direct connection to tumours of the digestive tract, namely CRC [5]. Although the risk is low, HP-related gastritis is linked to a higher risk of colorectal adenomas and CRC [6]. Furthermore, it was discovered that the CRC's malignant tissues had HP infection. The idea that HP is a direct CRC activator is still only a theory, though [7]. However, experimental data suggest that these bacteria may interact with the colonic mucosa in a number of ways that could lead to cancer, such as inducing and maintaining inflammatory responses, altering intestinal flora, and releasing toxins and/or hormonal mediators (like gastrin) that could promote the growth of tumours[8].

Therefore, our aim was to detect the relationship between HP Infection and colorectal cancer risk.

SUBJECTS AND METHODS

A case-control study was conducted at Internal Medicine Department, Benha University Hospital through the period from January 2023 to July 2023 including both inpatients and outpatient care. 85 individuals were classified into 2 groups: Group 1 included 50 patients diagnosed with colorectal carcinoma (after colonoscopy and histopathology). Group 2 "control group": 35 individuals without colorectal carcinoma and both groups were evaluated for H.Pylori infection.

Inclusion criteria: Patients aged 18-70 years and both genders were included.

Exclusion criteria: Patients with inflammatory bowel disease, gastric malignancies, other solid organ malignancies, patient receiving proton pump inhibitors or H2 blockers or patient with recent use of antibiotic.

All participants were subjected to the following: History taking and complete clinical examination, laboratory investigations including CBC, AST, ALT, Urea, Creatinine, INR, Total and direct bilirubin and H.Pylori stool antigen by ELISA. Colonoscopy was performed using (OLYMPUS GIF-CF 140 videoscope, Japan) and multiple colonic biopsies were taken for histopathological examination.

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Patients were not allowed to eat solid food for one day before to the colonoscopy in order to prepare them for the operation. They were instructed to just consume clear juices, water, and fluids. The day before the procedure, PREPAWEST was administered to the patients. Polyethylene glycol, sodium sulphate, sodium chloride, potassium chloride, sodium ascorbate, and ascorbic acid are the ingredients of PREPAWEST for oral solution, a laxative preparation that has been shown to be both acceptable and successful in patient treatment.

Pre-colonoscopy sedation:

Patients were frequently given intravenous sedative medications, such as midazolam, at the time of the surgery. An IV dose of 5–10 mg of midazolam is typical.

Procedure technique:

The patient is linked to the monitoring equipment and placed in the left lateral position following the acquisition of informed consent and a physical examination. A digital rectal examination is required following sufficient conscious sedation with intravenous midazolam. This is done not only to assess the level of preparation but also to look for any lumps or strictures in the anal area. After being inserted into the rectum, the colonoscope was moved under direct vision to the cecum, which was recognised by landmarks, and finally to the terminal ileum. After that, the scope was carefully removed while being examined for colour, texture, anatomy, and mucosal integrity. From the pathologic lesion, many biopsies were obtained for histopathology. The scope was retroflexed into the rectum to assess for anorectal disease and internal piles. After that, the patient is sent to the recovery area.

Histopathological examination: Referring the collected sample to a skilled pathologist was the initial step. The biopsy was then fixed, imbedded, and sectioned by the expert. Hematoxylin and eosin was then used to stain the sections. A preliminary survey was carried out. Individuals who met the endoscopic and clinical requirements and had their CRC verified histologically were given the diagnosis.

Ethical approval: Benha Medical Ethics Committee, Benha Faculty of Medicine gave its approval to this study. All participants gave written consent after receiving all information. The Helsinki Declaration was followed throughout the study's conduct.

Statistical analysis

SPSS version 28 was utilised for data administration and statistical analysis. The Shapiro-Wilk test, the Kolmogorov-Smirnov test, and data visualisation were employed to establish the normality of quantitative data. Quantitative data were summarised as means and standard deviations or medians and ranges, depending on normalty, whilst categorical data were displayed as numbers and percentages. Depending on the kind of variable, the independent t-test, Mann-Whitney U test, or Chi-square test were employed for group comparisons and H. pylori antigen analysis. CRC was predicted using multivariate logistic regression analysis, which yielded 95% confidence intervals and odds ratios. The fixed P value for statistical significant was set at 0.05, and for a very significant result, it was < 0.001.

RESULTS

The studied patients had significantly higher age (54 ± 10 years) than controls (41 ± 13) (P < 0.001). No significant difference was observed regarding gender (P = 0.790) (Table 1).

Table (1): Demographic characteristics of the studied groups

	Patients (n = 50)	**Controls (n = 35)**	**P-value**
Age (years)	54 ± 10	41 ± 13	**< 0.001***
Sex			
Males	30 (60)	22 (62.9)	0.79
Females	20 (40)	13 (37.1)	

*Significant

The studied patients had significant lower hemoglobin (9.5 ± 1.4 vs. 13.8 ± 0.9 g/dl, P < 0.001) but higher TLC (median = 7.3 vs. 6, P = 0.013) than controls. No significant difference was observed regarding platelets (P = 0.406). Also, the studied patients demonstrated significant higher urea (median = 33 vs. 25, P = 0.004) and creatinine (1 ± 0.3 vs. 0.9 ± 0.1, P = 0.029). Also, the studied patients demonstrated significant higher INR than controls (1.1 ± 0.2 vs. 1 ± 0.04 respectively, P = 0.024). No significant differences were observed regarding total bilirubin (P = 0.509), direct bilirubin (P = 0.069), ALT (P = 0.078), and AST (P = 0.911) (Table 2).

Table (2): Lab. investigations of the studied groups

		Patients (n = 50)	**Controls (n = 35)**	**P-value**
Hemoglobin (g/dl)	Mean ±SD	9.5 ±1.4	13.8 ±0.9	**<0.001***
Total leucocyte count	Median, (range)	7.3 (4 - 16)	6 (4 - 9)	**0.013***
Platelets	Median, (range)	344 (90 - 686)	326 (190 - 420)	0.406
Urea (mg/dl)	Median, (range)	33 (20 - 131)	25 (20 - 40)	0.004*
Creatinine (mg\dl)	Mean ±SD	1 ±0.2	0.9 ±0.1	0.029*
Total bilirubin (mg/dl)	Median, (range)	0.6 (0.2 - 3)	0.7 (0.2 - 1)	0.509
Direct bilirubin (mg/dl)	Median, (range)	0.2 (0.1 - 2.5)	0.2 (0.1 - 0.5)	0.069
INR	Mean ±SD	1.1 ±0.2	1 ±0.04	**0.024***
ALT (U/L)	Median, (range)	33 (23 - 200)	30 (21 - 40)	0.078
AST (U/L)	Median, (range)	28 (19 - 176)	30 (19 - 40)	0.911
Positive H. pylori stool Ag	n (%)	35 (70)	8 (22.9)	<0.001*

Median, range; non parametric test *Significant

The studied patients were classified according to the presence of H. pylori stool antigen. No significant differences were reported between those with positive and negative H. pylori stool antigen according to age (P = 0.926) and gender (P = 0.529) (Table 3).

Table (3): Demographic data of group 1 according to presence of H.Pylori stool antigen

		H. pylori Ag in stool		
		Positive (n = 35)	**Negative (n =15)**	**P-value**
Age (years)	Mean ±SD	53 ±8	54 ±13	0.926
Sex				
Males	n (%)	20 (57.1)	10 (66.7)	0.529
Females	n (%)	15 (42.9)	5 (33.3)	

No significant differences were reported between those with positive and negative H. pylori stool antigen regarding hemoglobin (P = 0.804), TLC (P = 0.655), and platelets (P = 0.409). No significant differences were reported between those with positive and negative H. pylori stool antigens regarding urea (P = 0.552) and creatinine (P = 0.833). Also, no significant differences were reported between those with positive and negative H. pylori stool antigen regarding total bilirubin (P = 0.747), direct bilirubin (P = 0.632), INR (P = 0.975), ALT (P = 0.718), and AST (P = 0.611) (Table 4).

Table (4): Lab. investigations of group 1 according to presence of H.Pylori stool antigen

		H. pylori Ag in stool		
		Positive (n = 35)	**Negative (n =15)**	**P-value**
Hemoglobin (g/dl)	Mean ±SD	9.4 ±1.4	9.6 ±1.5	0.804
Total leucocyte count	Median, (range)	7 (4.6 - 14)	7.5 (4 - 16)	0.655
Platelets	Median, (range)	324(90- 656)	366(143 - 686)	0.409
Urea (mg/dl)	Median, (range)	32 (20 - 131)	35 (23 - 100)	0.552
Creatinine (mg/dl)	Mean ±SD	1 ±0.2	1 ±0.2	0.833
Total bilirubin (mg/dl)	Median, (range)	0.6 (0.2 - 3)	0.6 (0.5 - 2)	0.747
Direct bilirubin (mg/dl)	Median, (range)	0.2(0.1 - 2.5)	0.2 (0.1 - 1.5)	0.632
INR	Mean ±SD	1.1 ±0.2	1.1 ±0.2	0.975
ALT (U/L)	Median, (range)	34 (23 - 200)	31 (23 - 67)	0.718
AST (U/L)	Median, (range)	29 (19 - 176)	26 (21 - 126)	0.611

Median, range; non parametric test. *Significant

Multivariate logistic regression analysis was done for positive H. pylori stool antigen to predict CRC. It revealed that the presence of H. Pylori stool antigen was significant associated with about ten times increased risk of CRC (OR = 9.902, 95% CI = 2.922 – 333.562, P < 0.001), controlling for age and gender (Figure 1).

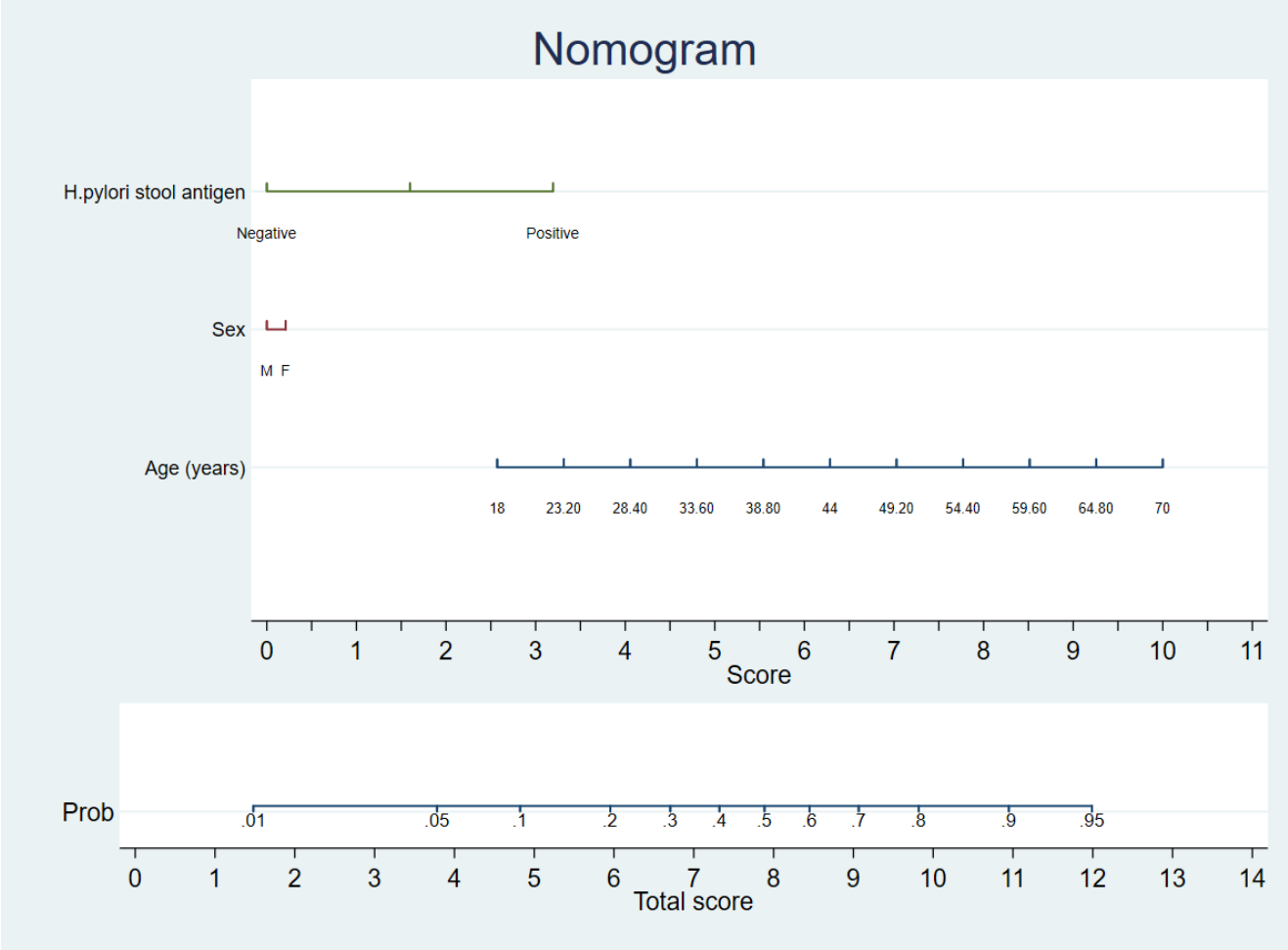

Figure (1): Nomogram for prediction of colorectal cancer.

DISCUSSION

H. pylori is a gram-negative bacterium affecting up to 50% of the global population, particularly prevalent in developing countries. It's a primary cause of gastritis, peptic ulcers, lymphoma, and gastric carcinoma. H. pylori is often acquired in childhood and persists without treatment, transmitted through various routes. H. pylori seropositivity is linked to various diseases, including cardiovascular, respiratory, digestive, and neurological conditions, as well as CRC [9]. Therefore, the aim of the present study was to detect the relationship between H. Pylori and CRC risk.

In our study, the studied patients had significantly higher age (54 ± 10 years) than controls (41 ± 13) with no significant difference between both groups regarding gender. In same line with our results, **He *et al.*** [10] had found that patients with CRC had higher age group than control group (60.8 versus 56.2 years old) with no gender difference. While, **Deo *et al.*** [11] discovered that the male-to-female ratio was 1.79:1 after looking at 970 CRC cases in total. 47.7 years was the mean age at presentation. A total of 337 patients (34.7%) met the criteria for being classified as young CRCs (diagnosed at age ≤ 40) which in difference from our results, which may be contributed to different sample size between both studies.

Regarding complete blood count in the present study, the studied patients had significantly lower hemoglobin (9.5 ± 1.4 vs. 13.8 ± 0.9 g/dl) but higher TLC (median = 7.3 vs. 6) than controls. No significant difference was observed regarding platelets between both groups. **Väyrynen *et al.*** [12] results are in same line with our results, they revealed that CRC cases had lower hemoglobin level mainly in their females. Nevertheless, anaemia was almost equally common in male and female patients. In addition, **Weng *et al.*** [13] discovered that while there was no discernible difference in platelets, CRC patients had significantly increased WBC, neutrophil, lymphocyte, monocyte, NLR, and systemic immune-inflammatory index levels.

Regarding renal functions, the CRC patients demonstrated significantly higher urea (median = 33 vs. 25) and creatinine (1 ± 0.3 vs. 0.9 ± 0.1) level compared to control group. This is in agreement with

Zhang *et al.* [14] who discovered that individuals with CRC had high serum levels of urea and creatinine as well as BUN and they were associated with more hospitalizations and with more prolonged complications and worse overall survival rate [14].

Regarding the liver functions, the studied patients demonstrated significantly higher INR than controls (1.1 ± 0.2 vs. 1 ± 0.04 respectively) with no significant differences regarding total bilirubin, direct bilirubin, ALT and AST. The present results agree with **Zhang *et al.*** [15] who examined 250 CRC patients and found that all of them had high level INR score mainly among older patients more than 58 years old. While **He *et al.*** [10] discovered that there was a negative correlation between the incidence of CRC and circulating liver function indicators (ALT, AST). This correlation persisted even after controlling for traditional risk variables and CRP. Secondary analysis revealed that the unfavourable relationships seemed more pronounced for rectal and distal colon cancers than for proximal colon cancers, thus CRC cases had low liver functions than healthy controls, which is in disagreement with the current study.

Regarding H. Pylori antigen in stool, the studied patients demonstrated significantly higher positive H. pylori stool antigen (70%) compared to controls (22.9%).

Teimoorian *et al.* [7] used the ELISA approach to look into the presence of H.Pylori antibodies because of its high sensitivity, specificity, and ease of use. When comparing patients with colon cancer and adenomatous polyps to the healthy controls, there was a substantial increase in H. Pylori infection with IgA>20 U/mL (the manufacturer's cut off point for IgA positive). In addition, individuals with colon cancer and adenomatous polyps had considerably higher rates of H. Pylori infection with IgG>10 U/mL (manufacturer's cut off point for IgG positive) than did the healthy controls.

The studied patients were classified according to the presence of H. pylori stool antigen. No significant differences were reported between those with positive and negative H. pylori stool antigen regarding age and gender. The current investigation corroborates the findings of **Moon *et al.*** [16] study, which looked at 318 seropositive patients, of which 256 (80.5%) had positive stool test results. The age and gender distributions of the stool test groups that tested positive and negative were identical.

The present study revealed no significant differences were reported between those with positive and negative H. pylori stool antigen regarding hemoglobin, TLC and platelets. Our findings corroborate those of researchers from Latin America and rural Haiti, who found no connection between H. pylori and anaemia [17, 18]. A different research, however, revealed that the frequency of anaemia was 15.3% in individuals who were H. pylori-negative and 25.8% in those who were H. pylori-positive. Microcytic hypochromic anaemia (61.3%) accounted for the majority of anemic H. pylori-infected individuals, with normocytic normochromic anaemia (16.1%), macrocytic normochromic anaemia (12.9%), and macrocytic hypochromic anaemia (9.7%) following closely behind. This discrepancy can result from the study's sample size, the disease's regional variance, or the techniques employed to diagnose anaemia and H. pylori [19].

The current study showed no significant differences were reported between those with positive and negative H. pylori stool antigens regarding urea and creatinine. In addition, the present study revealed no significant differences between those with positive and negative H. pylori stool antigen regarding total bilirubin, direct bilirubin, INR, ALT and AST. The current study demonstrated that in multivariate logistic regression analysis, which was done for positive H. pylori stool antigen to predict CRC. It revealed that the presence of H. Pylori stool antigen was significant associated with about ten times increased risk of CRC with controlling for age and gender.

A previous Taiwanese study by **Hu and colleagues** [20] follows up people who have either no H. pylori infection, successful H. pylori eradication, or persistent H. pylori infection for the development of colorectal adenoma. This study provides more evidence of a causal relationship between persistent H. pylori infection and CRC development. During the nine-year follow-up period, the incidence rates of adenoma in the non-infected and eradicated groups were similar, but the group with persistent infection had a three-fold higher incidence rate. Furthermore, it have been intriguing to investigate the relationship between the occurrence of colorectal adenoma and chronic H. pylori infection and related stomach epithelial damage, such as intestinal metaplasia, dysplasia, atrophic gastritis, or even gastric cancer. Furthermore, it is still necessary to clarify the processes behind this possible causal relationship, as the authors concluded. Another explanation is that HP infection induces inflammation, which raises prostaglandin E2 and cyclooxygenase 2 synthesis and activity. Prostaglandin E2 is a biomarker linked to inflammation and an increased risk of CRC. Furthermore, specific elements of the HP cell wall cause colorectal epithelial cells to develop cancer. When combined, these findings provide credence to HP's etiological function in the development of CRC [21]. Also, the findings of **Wang *et al.*** suggested that H. pylori infection may be a risk factor for colorectal tumours and polyps as they demonstrated a positive correlation between the rise in colonic polyp incidence, polyp quantity, and malignancy and the increase in H. pylori infection rate. Individuals who have an H. pylori infection have a 3.05 times higher risk of developing CRC and a 2.19 times higher risk of developing colorectal polyps. Furthermore, they discovered that individuals with colorectal polyps and

CRC had a greater incidence of H. pylori infection coexisting with atrophic gastritis or intestinal metaplasia compared to the control group. Colorectal adenomatous polyps, or CRC, and H. pylori-associated gastropathy were significantly correlated [22].

Limitations: The present study had some limitations, mainly the small sample size. Furthermore, our sample lacked genetic screening for cancer susceptibility genes and the expression of virulence factors such as CagA of a patient's particular H. pylori strain. In order to determine the impact of eradication on the incidence of adenomas and CRC in individuals who test positive for H. pylori, a randomised controlled study addressing this subject are to be carried out ultimately.

CONCLUSION

The present study confirmed the predictor value of positive stool antigen for H. pylori infection for development of colorectal cancer.

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REFERENCES

1. **Watari J, Chen N, Amenta P *et al.* (2014)**: Helicobacter pylori associated chronic gastritis, clinical syndromes, precancerous lesions, and pathogenesis of gastric cancer development. World J Gastroenterol., 20: 5461-73.
2. **Hooi J, Lai W, Ng W *et al.* (2017)**: Global Prevalence of Helicobacter pylori Infection: Systematic Review and Meta-Analysis. Gastroenterology, 153: 420-9.
3. **Wong B, Lam S, Wong W *et al.* (2004)**: Helicobacter pylori eradication to prevent gastric cancer in a high-risk region of China: a randomized controlled trial. JAMA., 291: 187-94.
4. **Dekker E, Tanis P, Vleugels J *et al.* (2019)**: Colorectal cancer. Lancet, 394: 1467-80.
5. **Butt J, Epplein M (2019)**: Helicobacter pylori and colorectal cancer-A bacterium going abroad. PLoS Pathog., 15: e1007861. doi: 10.1371/journal.ppat.1007861
6. **Machida-Montani A, Sasazuki S, Inoue M *et al.* (2007)**: Atrophic gastritis, Helicobacter pylori, and colorectal cancer risk: a case-control study. Helicobacter, 12: 328-32.
7. **Teimoorian F, Ranaei M, Hajian Tilaki K *et al.* (2018)**: Association of Helicobacter pylori Infection With Colon Cancer and Adenomatous Polyps. Iran J Pathol., 13: 325-32.
8. **Fireman Z, Trost L, Kopelman Y *et al.* (2000)**: Helicobacter pylori: seroprevalence and colorectal cancer. Isr Med Assoc J., 2: 6-9.
9. **Parikh N, Ahlawat R (2021):** Helicobacter Pylori. In: StatPearls. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK534233/
10. **He M, Fang Z, Hang D *et al.* (2021)**: Circulating liver function markers and colorectal cancer risk: A prospective cohort study in the UK Biobank. Int J Cancer, 148: 1867-78.
11. **Deo S, Kumar S, Bhoriwal S *et al.* (2021)**: Colorectal Cancers in Low- and Middle-Income Countries-Demographic Pattern and Clinical Profile of 970 Patients Treated at a Tertiary Care Cancer Center in India. JCO Glob Oncol., 7: 1110-5.
12. **Väyrynen J, Tuomisto A, Väyrynen S *et al.* (2018)**: Preoperative anemia in colorectal cancer: relationships with tumor characteristics, systemic inflammation, and survival. Sci Rep., 8: 1126. DOI:10.1038/s41598-018-19572-y
13. **Weng M, Zhao W, Yue Y *et al.* (2022)**: High preoperative white blood cell count determines poor prognosis and is associated with an immunosuppressive microenvironment in colorectal cancer. Front Oncol., 12: 943423. https://doi.org/10.3389/fonc.2022.943423
14. **Zhang B, Liu X, Liu X *et al.* (2023)**: The Impact of Serum Parameters Associated with Kidney Function on the Short-Term Outcomes and Prognosis of Colorectal Cancer Patients Undergoing Radical Surgery. Can J Gastroenterol Hepatol., 23: 2017171. doi: 10.1155/ 2023/ 2017171
15. **Zhang L, Ye J, Luo Q *et al.* (2020)**: Prediction of Poor Outcomes in Patients with Colorectal Cancer: Elevated Preoperative Prothrombin Time (PT) and Activated Partial Thromboplastin Time (APTT). Cancer Manag Res., 12: 5373-84.
16. **Moon H, Lee S, Hur M *et al.* (2018)**: Characteristics of Helicobacter pylori-seropositive subjects according to the stool antigen test findings: a prospective study. Korean J Intern Med., 33: 893-901.
17. **Santos I, Boccio J, Davidsson L *et al.* (2009)**: Helicobacter pylori is not associated with anaemia in Latin America: results from Argentina, Brazil, Bolivia, Cuba, Mexico and Venezuela. Public Health Nutr., 12: 1862-70.
18. **Shak J, Sodikoff J, Speckman R *et al.* (2011)**: Anemia and Helicobacter pylori seroreactivity in a rural Haitian population. Am J Trop Med Hyg., 85: 913-8.
19. **Asiimwe D, Bangi I, Esanyu J *et al.* (2023)**: Association Between Helicobacter pylori Infection and Anemia Among Adult Dyspeptic Patients Attending Kiryandongo General Hospital, Uganda. J Blood Med., 14: 57-66.
20. **Hu K, Wu M, Chu C *et al.* (2019)**: Decreased Colorectal Adenoma Risk After Helicobacter pylori Eradication: A Retrospective Cohort Study. Clin Infect Dis., 68: 2105-13.
21. **Ferrasi A, Pinheiro N, Rabenhorst S *et al.* (2010)**: Helicobacter pylori and EBV in gastric carcinomas: methylation status and microsatellite instability. World J Gastroenterol., 16: 312-9.
22. **Wang M, Kong W, Zhang J *et al.* (2020)**: Association of Helicobacter pylori infection with colorectal polyps and malignancy in China. World J Gastrointest Oncol., 12: 582-91.