PREVALENCE AND GENDER DIFFERENCES IN ACTIVE HELICOBACTER PYLORI INFECTION BASED ON FECAL ANTIGEN TEST IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract

Helicobacter pylori infection remains a significant health problem, particularly in developing countries. The aim of this study was to determine the prevalence of active *H. pylori* infection and evaluate the impact of age and gender in a population from the Republic of North Macedonia. The study was conducted during the period of June–October 2024 and included 279 patients aged 3–87 years who presented with gastrointestinal complaints. Fecal samples were analyzed for the presence of *H. pylori* antigen using the immunochromatographic method. Of the total 279 patients tested, 41 (14.7%) were found to be positive, while 238 (85.3%) were negative. The statistical analysis showed that gender had a significant impact on the test result (OR = 3.677; p = 0.005), while age did not show a statistically significant association (p = 0.992). The results indicate that active *H. pylori* infection has a relatively low prevalence in this population, while gender remains an important factor in its distribution.

Keywords:Helicobacter pylori, fecal antigen, prevalence, risk factors, gender.

Introduction

Helicobacter pylori infection is one of the most widespread chronic bacterial infections globally and continues to be a significant public health issue. It is estimated that more than half of the global population is colonized by this microorganism, although prevalence varies significantly between different regions and population groups (Hooi et al., 2017; Zamani et al., 2018). *Helicobacter pylori* colonizes the gastric mucosa and is strongly associated with a wide range of gastrointestinal pathologies, including chronic gastritis, peptic ulcer, MALT lymphoma, and gastric carcinoma (Kusters et al., 2006; IARC, 2012). Due to its role in gastric carcinogenesis, the World Health Organization has classified *Helicobacter pylori* as a Group I carcinogen (IARC, 2012).

The prevalence of *Helicobacter pylori* infection is influenced by a range of factors, including socioeconomic conditions, hygiene levels, population density, access to clean water, and the development of the healthcare system, with prevalence being significantly higher in developing countries compared to industrialized ones (Zamani et al., 2018; Mentis et al., 2015). In addition to environmental and socioeconomic factors, demographic factors such as age and gender have also been studied, although their association with the infection remains not always consistent across different populations (Naghibi et al., 2015).

Diagnosis of *Helicobacter pylori* includes both invasive and non-invasive methods. Invasive methods, such as gastric biopsy with histological examination, culture, and urease test, are considered more specific but are less suitable for epidemiological studies due to their invasive nature (Kusters et al., 2006). Among non-invasive methods, serological tests, urease breath test, and fecal antigen test are widely used in clinical practice and epidemiological research (Chey et al., 2017; Elbehiry et al., 2023). However, serological tests have the limitation of potentially reflecting past exposure to the bacterium, as IgG antibodies can remain present even after the infection has been eradicated (Kusters et al., 2006). In this regard, the fecal antigen test is considered a reliable method for identifying active infection, as it allows for the detection

of the current presence of the bacterium in the gastrointestinal tract (Kassid et al., 2022; Elbehiry et al., 2023).

Although *Helicobacter pylori* remains a pathogen of high clinical and epidemiological importance, data on the prevalence of active infection and associated factors in specific populations remain limited, especially in the Balkan region. In this context, the aim of this study was to assess the prevalence of active *Helicobacter pylori* infection, identified through the fecal antigen test, and to analyze the impact of demographic factors, such as age and gender, in a population from the Republic of North Macedonia.

Materials and Methods

This retrospective study was conducted during the period of June–October 2024 and includes 279 patients aged 3–87 years who presented with gastrointestinal complaints.

Fecal samples were analyzed for the presence of *Helicobacter pylori* antigen at the Institute of Microbiology and Parasitology at the Faculty of Medicine in Skopje, using the immunochromatographic method with monoclonal antibodies. This method allows for the qualitative detection of *Helicobacter pylori* antigen in feces and is used for the identification of active infection.

Demographic data, including age and gender, were included in the analysis. Statistical processing of the data was performed using IBM SPSS software (version 20.0). Logistic regression was used to assess the relationship between variables, and p-values < 0.05 were considered statistically significant.

Results and Discussion

3.1 Reults: This study included a total of 279 patients tested for the presence of *Helicobacter pylori* through fecal antigen. Table 1 presents the distribution of results according to absolute and relative frequencies, showing the prevalence of active infection in the studied population.

Table 1. Prevalence of active Helicobacter pylori infection based on fecal test

Testi_feces					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Negativ	238	85.3	85.3	85.3
	Pozitiv	41	14.7	14.7	100.0
	Total	279	100.0	100.0	

From the data presented in Table 1, of the total 279 patients tested, 41 (14.7%) were found to be positive, while 238 (85.3%) were negative. These data indicate that active *Helicobacter pylori* infection is present in a relatively low percentage of the analyzed patients, suggesting a moderate prevalence of active infection in this population.

The analysis by gender is presented in Table 2, which shows the distribution of positive and negative fecal test results between females and males.

Table 2. Distribution of active Helicobacter pylori infection by gender

Gender	**Negative n (%)**	**Positive n (%)**	**Total**
Female	146 (80.7)	35 (19.3)	181
Males	92 (93.9)	6 (6.1)	98
Total	**238 (85.3)**	**41 (14.7)**	**279**

From the data presented in Table 2, females had a significantly higher probability of being positive for *Helicobacter pylori* compared to males. Of the 181 females tested, 35 (19.3%) were positive, while of the 98 males, only 6 (6.1%) were positive. These results indicate a higher prevalence of active infection in females compared to males.

To assess the impact of demographic factors on the presence of active *Helicobacter pylori* infection, a logistic regression model was applied. The results showed that gender is a statistically significant factor in predicting the infection (OR = 3.677; p = 0.005), indicating that females are about 3.6 times more likely to test positive compared to males. In contrast, age did not show a statistically significant impact on the presence of the infection (p = 0.992).

Furthermore, the correlation analysis showed a very weak and statistically insignificant relationship between age and the fecal test result (r = 0.014; p = 0.810). These results indicate that, in this sample, gender is a more important factor in the distribution of active *Helicobacter pylori* infection than age.

Figure 1 presents the histogram of the age distribution of the patients included in the fecal test analysis.

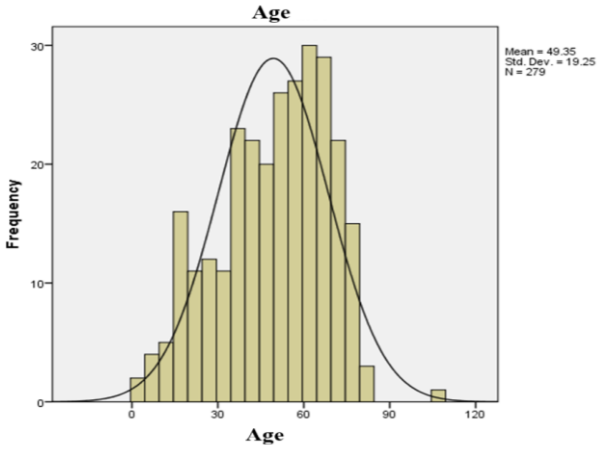

Figure 1. Histogram of the age distribution of patients tested for *Helicobacter pylori* in feces.

3.2 Discussion: The prevalence of active *Helicobacter pylori* infection observed in this study (14.7%) was lower compared to many studies reported in developing countries, where prevalence often ranges between 30% and 50% (Hooi et al., 2017; Zamani et al., 2018). This difference can be partially explained by the diagnostic method used, as the fecal antigen test identifies the current presence of the bacterium and, consequently, reflects active infection, while serological methods may yield higher values due to the presence of antibodies that remain detectable even after past exposure or previous infection (Kusters et al., 2006; Chey et al., 2017). For this reason, the fecal antigen test is considered a more specific approach for assessing the current prevalence of the infection (Kassid et al., 2022; Elbehiry et al., 2023).

One of the most important findings of this study is the statistically significant association between gender and active infection, with females showing a higher probability of a positive result compared to males. This finding is not always consistent in the literature. Some studies

have not reported significant gender differences, while others have shown higher prevalence in males or similar distribution between genders (Zamani et al., 2018; Naghibi et al., 2015). The differences observed in this study may be related to biological, hormonal, or socio-cultural factors, as well as healthcare-seeking behavior, although these variables were not directly analyzed.

On the other hand, age did not show a statistically significant impact on the presence of active infection. This result suggests that the current presence of the bacterium does not necessarily follow the same distribution pattern as long-term exposure, as active infection represents a more dynamic state and is potentially influenced by previous treatment, immune status, and other environmental factors (Mentis et al., 2015). The lack of a significant association with age in this study is consistent with the fact that the fecal antigen test more accurately reflects the current presence of the bacterium rather than exposure history.

However, this study has several limitations that should be considered when interpreting the results. The retrospective design and the lack of data on other potential risk factors, such as socioeconomic status, hygiene and sanitation conditions, diet, and lifestyle, limit the full interpretation of the factors influencing the spread of the infection. Furthermore, the sample size and the unequal gender distribution may have influenced the observed results.

In conclusion, the findings of this study contribute to a clearer understanding of the distribution of active *Helicobacter pylori* infection and highlight the importance of using diagnostic methods that differentiate active infection from past exposure. Furthermore, the results suggest that gender may play an important role in the distribution of the infection, while the impact of age remains limited in this population.

Conclusions

This study demonstrates that the assessment of *Helicobacter pylori* through the fecal antigen test provides a more accurate reflection of active infection, revealing a lower prevalence compared to serological methods. Gender was identified as an important factor in the distribution of the infection, while age did not show a statistically significant impact. These results emphasize the importance of using more specific diagnostic methods in epidemiological studies and clinical practice.

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