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**Helicobacter Pylori Infection and
Functional Dyspepsia in Adolescence**

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Helicobacter Pylori Infection and Functional Dyspepsia in Adolescence

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Abstract

Introduction: Studies confirm that *Helicobacter pylori* (*H. pylori*) infection may be a predisposing factor for gastric pathology later in life. This study consisted in determining the prevalence of *H. pylori* present in the stomach and functional dyspepsia in sample of Portuguese adolescents.

Participants and methods: A sample of 437 adolescents aged 12 to 19 years old, attending a public school in Sátão, Portugal, was enrolled in this cross-sectional study. A self-administered questionnaire focusing socio-demographic variables, social and daily habits and gastric-related pathologies was filled out by all participants in this study. The self-reported form for children and adolescents of the Rome III Diagnostic Questionnaire was also applied in order to assess functional dyspepsia. The adolescents were screened for *H. pylori* infection using the Urease Breath Test (UBT) that consists in the exhalation of carbon dioxide in samples before and after swallowing urea labeled with non-radioactive carbon-13. Prevalence was expressed in proportions and compared by the chi-square test. Crude odds ratio (OR) with 95% confidence intervals (CI) were used.

Results: The prevalence of gastric *H. pylori* was 35.9%. Functional dyspepsia was present in 22.4% of the sample and was associated with age (≤ 15 years OR=2.25, 95%CI=1.17-4.33), residential area (rural OR=1.98, 95%CI=1.05-4.35) and family history of gastric disease (OR=3.39, 95%CI=1.17-9.87). After adjustment by multivariate logistic regression for socio-demographic variables and family history of gastric disease, the results demonstrate no association between *H. pylori* infection and functional dyspepsia (OR=1.08 95%CI=0.8-1.3).

Conclusions: We found a high prevalence of *H. pylori* infection and functional dyspepsia among adolescents, suggesting that gastric pathology continues to be an important public health issue. This study provides important baseline measurements for future preventive measures.

Keywords: Adolescents, Functional dyspepsia, H. pylori, Infection, Urease Breath Test.

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Introduction

The recognition of the pathological aspects of *Helicobacter pylori* (*H. pylori*) originated from studies performed by Marshal and Warren in 1982 (Dunn et al. 1997). *H. pylori* has an important role in several gastro-duodenal pathologies making its diagnosis and knowledge of its epidemiology necessary in order to better understand its main determinants and the best primary and secondary prevention measures that should be adopted (Glupczynski 1998). *H. pylori* is a gram-negative bacterium that colonizes the human stomach, beneath the gastric mucous layer, adjacent to the gastric epithelial cells and, although it is considered a non-invasive bacterial strain, it can originate chronic inflammation of the gastric mucosa (Duś et al. 2013, Loster et al. 2006, Dunn et al. 1997). Gastric infection caused by this bacterium is highly associated with the development of functional dyspepsia, chronic and atrophic gastritis, duodenal ulcers and gastric carcinoma (Goh et al. 2011).

The most common transmission route of *H. pylori* is the fecal-oral tract which permits the establishment of the association of infection risk with reduced levels of sanitation and low socioeconomic status which may change depending on demographic and residential area (Goh et al. 2011, Silva Rossi-Aguiar et al. 2009).

Various diagnostic tests are available for the identification of *H. pylori* in the human patient. Endoscopic tests are best for a primary diagnosis of *H. pylori* infection, however, there are other tests, such as the rapid Urease Breath Test (UBT), that help diagnostic and treatment decision-making and can easily be used in epidemiological data collection (Glupczynski 1998). Studies have shown that more than 50% of the world's population is infected, in which the developed countries show a lower incidence of *H. pylori* infection when compared with developing countries. (Graham et al. 1991, Windle et al. 2007).

The study designed by Almeida et al. among portuguese schoolchildren between 11 and 18 years old, demonstrated a prevalence of 40.6% of *H. pylori* infection with a clear tendency to decrease in older ages. The same study demonstrated that the decrease of the incidence of the infection was associated with better sanitary and socioeconomic conditions in Portugal (Almeida et al. 2012).

The objective of the present study was to determine the prevalence of *H. pylori* and functional dyspepsia in a sample of Portuguese adolescents.

Participants and Methods

A final sample of 437 adolescents aged between 12 and 18 years old, attending a public school in Sátão, Portugal, participated in the study. Data collection was accomplished between September and December of 2012. A self-administered questionnaire was applied with questions concerning socio-demographic aspects (gender, age, residential area), social and daily habits and gastric-related pathologies (including family history of gastric diseases). The

self-reported form for children and adolescents of the Rome III Diagnostic Questionnaire was also applied in order to assess functional dyspepsia. Functional dyspepsia was considered when the adolescent answered having:

- Upper abdominal pain or discomfort "several times a week" or more often.
- Duration of upper abdominal pain or discomfort is "2 months" or longer.
- Not exclusively relieved with defecation "sometimes" or less often.
- Not associated with change in stool form: "never" or "once in a while" indicated: for softer stools and harder stools.
- Not associated with change in stool frequency: "never" or "once in a while" indicated for more stools and fewer stools.

A total sample of 437 adolescents (complete cases) were screened for *H. pylori* infection by the UBT test that consists in the exhalation of carbon dioxide in samples before and after swallowing urea labeled with non-radioactive carbon-13. If infection is present, the urease produced by *H. pylori* hydrolyzes the urea to form ammonia and labeled bicarbonate that is exhaled as carbon dioxide. The labeled carbon dioxide is detected by a spectrometer and each sample result would be classified as positive or negative for *H. pylori* infection.

This research has been performed in accordance with the Declaration of Helsinki and was submitted and approved by the Ethics Committee of the Health School and Research Centre for Education, Technology and Health Studies of the Polytechnic Institute of Viseu, Portugal (CI&DETS).

Data analysis was accomplished by using the software Statistical Package for the Social Sciences (version 18.0). Prevalence was expressed in proportions and odds ratio (OR) with 95% confidence intervals (CI) were used to measure the strength of association between variables. Proportions were compared by the Chi-square test.

Results

The final sample was composed by 437 adolescents, 38.3% male gender and 61.7% female gender. Having into account the exclusion criteria (informed consent given by parents), we obtained a response rate of 88.6% of the total school population. Performing the analysis of the distribution of the cohort by residential area, we could verify that the majority of participants live in rural areas (65.3% vs 34.7%).

The prevalence of gastric *H. pylori* detected by the UBT was 35.9% (157 positive individuals from a total of 437).

Functional dyspepsia was present in 22.4% of the sample and was found to be associated with age (≤ 15 years, OR=2.25; 95%CI=1.17-4.33), residential

area (rural, OR=1.98; 95%CI=1.05-4.35) and family history of gastric disease (OR=3.39, 95%CI=1.17-9.87) (Table 1).

After adjustment by multivariate logistic regression for age, gender, residence area and family history of gastric disease, the results demonstrate no association between *H. pylori* infection and functional dyspepsia (OR=1.08 95%CI=0.8-1.3).

Table 1. Association Between the Presence Functional Dyspepsia and Socio-Demographic Variables, Family History of Gastric Disease and *H. Pylori* Infection

Functional dyspepsia	Yes		No		<i>p</i>
	<i>N</i>	%	<i>N</i>	%	
Gender					
Male	5	16.7	25	83.3	
Female	21	24.4	65	75.6	0.3
Age					
≤ 15 years	12	37.5	20	62.5	
> 15 years	14	16.7	70	83.3	0.02
Residential area					
Rural	19	28.4	48	71.6	
Urban	7	14.3	42	85.7	0.04
Family history of gastric diseases					
No	15	17.6	70	82.4	
Yes	8	42.1	11	57.9	0.03
<i>H. pylori</i> infection					
No	12	18.5	53	81.5	
Yes	14	29.8	33	70.2	0.1

Source: Authors' estimations.

Discussion

The prevalence of gastric *H. pylori* infection was higher among portuguese adolescents in comparison with studies developed by Mana et al. (11.0%) in Belgium and Sousa et al. (24.9%) in Brazil, but also lower when compared with studies developed by Constanza et al. (47.6%) in Mexico (Mana et al. 2013, Sousa et al. 2001, Constanza et al. 2004). The different results obtained may also be explained by the various methodologies applied among the studies. When comparing the prevalence results of different studies it is important to consider how the detection of gastric *H. pylori* was accomplished.

Our findings are similar to those obtained by Almeida et al. in Portugal, among portuguese schoolchildren between 11 and 18 years old (Almeida et al. 2012). Curiously, the methodologies applied for the detection of gastric *H. pylori* infection in the present study and the study developed by Almeida et al.

were different. Almeida et al. used endoscopic procedures to detect the presence of *H. pylori* infection, while, in our study, we only used the UBT diagnostic test. Considering that data collection was made in the classroom and the limited time given to collect the data necessary for the research, the only diagnostic test that could be used, under the circumstances, was the UBT.

Upper gastrointestinal symptoms are common among younger populations. In the study presented by Hyams et al., 65% of adolescents have noted the presence of symptoms compatible with functional dyspepsia, which is higher compared to the prevalence obtained in the present study (Hyams et al. 2000). Another study developed by Chitkara et al., reveals that nearly 57.4% of children developed functional dyspepsia (Chitkara et al. 2003). The present study demonstrates that no statistical association was found between the presence of *H. pylori* and functional dyspepsia. These results are similar to those confirmed by Danesh et al. that in a systematic review indicate that there is no statistical association between the presence of *H. pylori* infection and functional dyspepsia (Danesh et al. 2000). However, functional dyspepsia seems to be associated with socio-economic and demographic factors and family history of gastric diseases. These results are similar to studies that demonstrate that hereditary factors may be associated with gastric diseases, namely gastric carcinoma development (Stec-Michalska et al. 2009).

Conclusions

A high prevalence of *H. pylori* infection and functional dyspepsia among adolescents was found, suggesting that gastric pathology continues to be an important public health issue. The population should be advised of the important role that *H. pylori* can have in the development of gastric diseases, namely among the adolescents in order to avoid serious gastroduodenal pathologies during adulthood. This study provides important baseline measurements for future preventive measures including vaccine research, improvement in dietary intake and sanitary and socioeconomic conditions. Further studies to determine subgroups at a higher risk of *H. pylori* infection may help targeting the more susceptible populations.

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