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Original Article

Upper socioeconomic status is associated with lower Helicobacter pylori infection rate among patients undergoing gastroscopy

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Abstract

Introduction: Socioeconomic factors play an important role in the prevalence of *Helicobacter pylori* (HP) infection. The aim of this study is to investigate HP prevalence among symptomatic patients in the upper socioeconomic segment of the population undergoing gastroscopy in an endemic urban region.

Methodology: Over a 12-month period, data were collected from the first consecutive 1000 patients (500 from university hospital, 500 from community hospital) who had gastroscopy and HP evaluation.

Results: Overall, 211/1000 patients (21.1 %) were found to have HP in gastric biopsies. The specificity, sensitivity, positive predictive value, negative predictive value and diagnostic accuracy of rapid urease test were 87.5%, 99.7%, 99%, 96.5%, and 96.9% respectively. Atrophic gastritis, gastric and duodenal ulcers were significantly more common in HP positive patients. Age based distribution of HP prevalence: > 6 decades (15.5%), 3rd-5th decades (26.1%), < 3rd decades (10.4%).

Conclusion: In an HP endemic country, the prevalence of HP infection among symptomatic patients belonging to the upper socioeconomic segment of the population appears to be markedly lower. The lowest prevalence in young patients is expected to result in future decrease in HP prevalence.

Key words: *Helicobacter pylori*; infection; prevalence.

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Introduction

Helicobacter pylori (HP) is a Gram-negative bacterium that colonizes the gastric epithelial lining, and is the most common chronic human bacterial infection, found in approximately half of the world's population [1]. It causes chronic gastritis and significantly increases the risk of developing peptic ulcer disease, gastric adenocarcinoma and mucosa associated lymphoid tissue lymphoma [2,3]. Eradication of HP has been shown to reduce the incidence of gastric cancer [4]. The efficacy of the HP eradication treatment has decreased, therefore selection of treatment based on local resistance patterns is very important [5,6].

Globally, the prevalence of HP infection in developing countries is higher than developed countries [1]. Depending on the risk factors, the HP prevalence may widely vary within a country as well. The variation in prevalence of HP infection depends on age of acquisition, socioeconomic status, high population density, poor sanitation and hygiene. HP is generally acquired during the first years of life and up to 90% of the population is infected by adulthood in developing countries [7].

Turkey, the country from which the current report originates, is considered to have a high prevalence of HP. A recent systematic review and meta-analysis reported a prevalence of 77.2% (95% confidence interval: 71.4 – 83.1) [1]. Given this, there is regional heterogeneity in HP distribution [8]. This relatively high infection rate, with a hallmark heterogeneous national distribution, is superimposed on geo-socioeconomically divergent regions is also cared for by a universal health care system that allows universal access to health care. All residents registered for Social Security are entitled to medical treatment free of charge in designated hospitals. In effect, this serves the majority of the Turkish population [9,10].

Approximately 2% of the population (mostly in urban areas) chooses to carry private health insurance as well.

Studying the prevalence of HP (hypothesized to be lower) in the upper socioeconomic population (self-paying or with a private health insurance) may uncover novel public health strategies that could help to lower HP for all. However, the upper socioeconomic population remains understudied, even in endemic Turkey. Therefore, the aim of this study was to determine HP prevalence in a high-socioeconomic status private practice setting in Istanbul. The study group consisted of patients who underwent esophagogastroduodenoscopy (EGD) at a private university hospital and community hospital providing care to self-paying patients or with a private healthcare insurance.

Methodology

Study population

This study was carried out in two non-profit institutions in Istanbul, Turkey: a private community hospital (American Hospital) and a university hospital (Koç University School of Medicine Hospital). Patients receiving EGD in this study from these institutions were either self-pay or used private health insurance. This classifies them in the upper socioeconomic segment of the population.

From May 2017 to May 2018, data on consecutive EGD procedures performed with HP status evaluation (histopathology +/- rapid urease test (RUT)) at both institutions were collected prospectively. Patients less than 18 years of age and non-Turkish citizens were excluded. Performance of RUT was left to the discretion of the physician performing the procedure. Data were collected retrospectively from the first consecutive 500 patients (inpatient and outpatient) from each institution. The research protocol was approved by the institutional review board. The demographics, EGD indication, histopathology results for HP (positive or negative) +/- RUT results (positive or negative), endoscopy findings were analyzed.

Equipment and procedure

All EGDs were performed using forward-viewing endoscopes (Olympus GIF-H190; Tokyo, Japan). Biopsy specimens from the gastric antrum and corpus were taken and tissues obtained were placed into the RUT kit (CLOtest; Ballard Medical Products, Utah; USA). The kits were sealed and read by the physician performing the procedure at 30 minutes, 1 and 24 hours. A color change from yellow to red/rose was considered to be positive. In addition, two separate biopsy specimens from the gastric antrum (greater curvature and incisura) and corpus (greater and lesser curvatures) were taken and placed into 10% formalin solution for

Table 1. Procedure indications and *Helicobacter Pylori* (HP) positivity according to procedure indication.

Disease	Number (%)	HP positivity (%)
Dyspepsia	500 (50)	116 (23.3)
Gastroesophageal reflux	129 (12.9)	26 (20.1)
Abdominal pain	126 (12.6)	26 (20.6)
Anemia	52 (5.2)	12 (23)
Poor nutrition	41 (4.1)	4 (9.7)
Malignancy evaluation	36 (3.6)	5 (13.8)
Gastrointestinal bleeding	30 (3)	9 (30)
Dysphagia	23 (2.3)	5 (21.7)
Liver disease work-up	15 (1.5)	1 (6.6)
Nausea and vomiting	15 (1.5)	2 (13.3)
Diarrhea	8 (0.8)	1 (12.5)
Gastric outlet obstruction	4 (0.4)	
Crohn's disease	3 (0.3)	
Post-bariatric surgery	2 (0.2)	
Gastric polyp	2 (0.2)	
Atrophic gastritis	2 (0.2)	
Celiac disease work-up	2 (0.2)	
Stool occult blood positivity	2 (0.2)	2 (100)
Neuroendocrine tumor	2 (0.2)	
Vitamin B12 deficiency	1 (0.1)	1 (100)
Low ferritin	1 (0.1)	
Cardia tumor	1 (0.1)	
Intestinal metaplasia	1 (0.1)	
Gastric wall thickening	1 (0.1)	
Pre-bariatric surgery	1 (0.2)	1 (100)

histopathological evaluation. HP status was determined by reviewing all specimens stained with hematoxyline and eosin. Official pathology reports were reviewed by the physician performing the procedure, and HP status (negative or positive) was recorded to the data collection sheet. The pathologist was blinded to the RUT results.

Statistical analysis

Statistical analysis was performed using STATA Version 11 (Data Analysis and Statistical Software: StataCorp LLC; College Station, TX, USA), and statistical significance was set as < 0.05.

Results

Over the 12-month period, data from the first 500 consecutive EGDs were prospectively collected from the university hospital (Male: 266 (53.2%), Female: 234 (46.8%)) (Average age (years) ± Standard deviation (SD): 59.9 ± 16.5), and private hospital (Male: 255 (50.9%), Female: 246 (49.1%)) (Average age (years) ± SD: 51.7 ± 14.1).

Of these 500 patients, 99/500 (19.8%) from the university hospital were diagnosed with HP based on the gastric biopsy. One hundred and twelve out of 500 patients (22.4%) from the private hospital were found to have HP in gastric biopsies. HP prevalence was not significantly different between the private and university institutions in this study (p = 0.31). Overall, 211 out of 1000 patients (21.1%) were found to have HP in gastric biopsies. Procedure indications and HP prevalence stratified by age were presented at Table 1. Overall prevalence of HP stratified by age were: 20-29 years: 5 patients (11.9%), 30-39 years: 34 patients (28.5%), 40-49 years: 58 patients (26.6%), 50-59 years: 51 patients (24.4%), 60-69 years: 33 patients (17.8%), 70-79 years: 26 patients (16%), 80-89 years: 4 patients (8.3%) (Table 2).

Performance of RUT was based on operator preference. RUT was performed in 34% of patients at the University hospital and in 98.8% of patients at private hospital. Therefore, in order to evaluate diagnostic accuracy of RUT, we took into consideration the results from the private hospital where 98.8% of patients had both histopathology and RUT. HP infection was demonstrated by both a positive result in the rapid urease test and the presence of bacteria seen on histologic evaluation in 98 patients (87.5%). Fourteen patients (12.5%) had a negative result on the rapid urease test but bacteria were seen on histologic evaluation. One patient had a positive rapid urease test, but bacteria were not seen on histologic evaluation. Twenty-eight out of 500 patients (5.6%) had prior HP eradication therapy. Four out of 28 patients (14.2%) had a prior failed HP eradication therapy. The patient who had a positive RUT and negative histopathologic HP evaluation had a previous HP eradication therapy. Eight out of 500 patients (1.6%) received proton pump inhibitors (PPI) within 10 days prior to endoscopic evaluation. Two patients who received PPI therapy found to have HP infection on histopathologic evaluation, and all of them had negative RUT. Accepting that histopathology is the gold-standard test to diagnose HP infection, the specificity, sensitivity, positive predictive value, negative predictive value and diagnostic accuracy of RUT were 87.5% (confidence interval (CI): 79.9% - 93 %), 99.7% (CI: 98.6% - 100%), 99% (CI: 94.5% - 100 %), 96.5% (CI: 94.1% - 98%), and 96.9% respectively.

Fifteen out of 211 (7.1%) HP positive patients (1 patient in third decade, 2 patients in forth decade, 5 patients in fifth decade, 5 patients in sixth decade, 1 patient in seventh decade and 1 patient in eighth decade) and 27 out of 789 (3.4%) HP negative patients (5 in third decade, 4 patients in forth decade, 5 in fifth decade, 8 in sixth decade and 5 seventh decade) had atrophic gastritis (Table 3). Atrophic gastritis is 2.1

Table 2. *Helicobacter Pylori* prevalence stratified for according to age categories.

		HP (+)			HP (-)		
Age	**Number (%)**	**Number**	**%**	**M/F**	**Number**	**%**	**M/F**
< 20	6 (0.6)	0	0		6	100	5/1
20-29	42 (4.2)	5	11.9	0/5	37	88.1	16/21
30-39	119 (11.9)	34	28.5	15/19	85	71.5	42/43
40-49	218 (21.8)	58	26.6	30/28	160	73.4	80/80
50-59	209 (20.9)	51	24.4	27/24	158	75.6	86/72
60-69	185 (18.5)	33	17.8	13/20	152	82.3	80/52
70-79	162 (16.2)	26	16	14/12	136	84	82/54
80-89	48 (4.8)	4	8.3	3/1	44	91.7	16/28
>90	11 (1.1)	0	0		11	100	3/8

HP*: Helicobacter Pylori*; M: Male; F: Female.

Table 3. Atrophic gastritis prevalence stratified for according to *Helicobacter Pylori* status.

HP positive N (%) 211 (21.2)		HP negative N (%) 789 (78.9)	
AG positive	**AG negative**	**AG positive**	**AG negative**
15 (7.1)	196 (91.9)	27 (3.4)	771 (96.2)

HP: *Helicobacter Pylori;* AG: Atrophic gastritis.

times significantly more common (Odds Ratio (OR): 2.1, (Confidence Interval (CI): 1.05-4.35, p = 0.016)) among HP positive patients than patients with no HP infection. Atrophic gastritis and intestinal metaplasia were present in 10 patients with positive HP status (4.7%), and 24 patients with negative HP status (3%). No patient had atrophic gastritis, intestinal metaplasia and dysplasia simultaneously. Gastric adenocarcinoma was identified in 2 patients with positive HP status (0.9%) and 2 patients with negative HP status (0.8%). No patient had gastric lymphoma. Fifty-six patients had gastric ulcer, and 23 patients had duodenal ulcer. Gastric ulcer was present in 33 patients with positive HP status (15.6%), and in 23 patients with negative HP status (2.8%). Gastric ulcer is 6.2 times significantly more common (OR: 6.2, (CI: 3.45-11.41, p < 0.001)) among HP positive patients than patients with no HP infection. Duodenal ulcer was present in 16 patients with positive HP status (7.5%), and in 7 patients with negative HP status (0.2%). Duodenal ulcer is 9.2 times significantly more common (OR: 9.2, (CI: 3.53-26.94, p < 0.001)) among HP positive patients than patients with no HP infection.

Discussion

This study shows that an upper socioeconomic enclave in the city of Istanbul has a lower prevalence of HP (comparable to HP prevalence in developed countries) compared to prevalence in the endemic greater Turkey [11]. The current study included both private community hospital and private university hospital settings to capture a diverse population of upper socioeconomic patients, defined as self-pay/privately insured in this country having universal single-payer access to health care for all citizens.

There were no statistically significant differences in the HP prevalence between the two study hospitals (Chi square p value: 0.31). Among patients undergoing EGD, HP infection was found in 21.1% of patients. This is the lowest HP prevalence result ever reported in Turkey. The results of our study were consistent with the HP infection prevalence in Europe, ranging 20-40% [8]. A worldwide downward trend in the prevalence of HP infections has been noticed in developed as well as developing countries, likely due to the improvement of sanitary conditions with socioeconomic progress [12-14].

While the overall prevalence of HP in Turkey is estimated at around 77.2 %, substantial regional differences are reported [1,8]. Regional variations are strongly associated with socioeconomic status, ethnicity, as well as migration status [15,16]. The overall prevalence of HP infection was 82.5% in a country wide normal population based study using ^{13}Carbon Urea Breath Test [8], reporting current residential region as a risk factor for HP infection. Relating to that study, western regions of Turkey benefit from improved infrastructural development, education, and standard of living (housing, family size, income level). Still the HP prevalence in the western part of the country (where Istanbul is located) was 80.3 %, whereas in the eastern part of the country was 88.1% [8].

An increase in the risk of HP infection with decreasing socioeconomic status has been reported [17-19]. Our study differs from the previously reported studies in several aspects. It is not a population-based study as HP infection was determined among symptomatic patients who underwent EGD. Therefore, the actual prevalence of HP infection in asymptomatic persons belonging to the upper socioeconomic segment of the population in Istanbul would probably be even lower compared to the individuals requiring invasive investigation for their symptoms.

In our study, age-based distribution of HP infection showed maximum prevalence between the third to fifth decades (143/546 (26.1 %)). The prevalence of HP infection in patients > 60 years was 15.5% (63/406), and in patients < 30 years of age was 10.4% (5/48). The variation in HP infection between younger and middle aged adults is likely due to birth cohort effect as well as cumulative risk of exposure with advanced age. In developing countries, HP infection is usually acquired during childhood or early adulthood. However, in developed countries, a decreasing prevalence of HP infection among children and adolescents has been noted over the last few decades [20].

In our patient group, the low prevalence of HP infection in patients < 30 years of age may be an indicator that the prevalence of HP infection is expected

to result in further decrease in HP infection prevalence in the upper socioeconomic segment of the population. Elderly patients had lower HP rates that adults in the current study, possibly related to prior lines of antibiotic therapy or increased prevalence of atrophic gastritis with aging, which may induce hostile environment for the bacterium [21].

Chronic *Helicobacter pylori* infection is associated with gastric and duodenal ulcers, as well as development of precancerous lesions such as atrophic gastritis, or intestinal metaplasia, and cancer [2,3]. As expected, in our study, patients infected with HP had significantly more atrophic gastritis, gastric and duodenal ulcers than uninfected patients.

This study has several limitations. Self-pay/privately insured status was used as a surrogate marker for upper socioeconomic status, but actual income data were not collected from patients. Patients who had previous endoscopies at other institutions or prior HP therapies could not be identified. This might have resulted in lower HP prevalence than patients having their first gastroscopies. Recent bismuth, histamine 2 receptor blocker, antibiotic and proton pump inhibitor use were not consistently recorded in endoscopy reports, which might have confounded HP prevalence.

Conclusion

In summary, prevalence of HP infection is markedly lower in patients of higher socioeconomic level in Istanbul undergoing gastroscopy. Socioeconomic progress will likely lead to a segment of population to have a low HP infection rate, even within high HP prevalence countries. The last Maastricht Consensus prompted HP workup and treatment in dyspeptic patients without alarm symptoms living in HP prevalent areas (>20% prevalence) [3]. But in low prevalence areas, empiric proton pump inhibitor therapy is advocated over the test and treat strategy. The current study may help guide cost-effective treatment strategies in socioeconomically heterogeneous nations by providing granularity from this study of an upper socioeconomic population in a developing country.

Authors' Contributions

Each author contributed equally to the data collection and analysis. The paper was written by Dr. Tan Attila.

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