EPIDEMIOLOGIC CHARACTERISTICS OF HELICOBACTER PYLORI INFECTION AND SOCIODEMOGRAPHIC FEATURES OF REFLUX-RELATED SYMPTOMS IN SOUTHEAST HUNGARY

Ph.D. Thesis

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I. **Bálint L**, Tiszai A, Kozák G, Dóczi I, Szekeres V, Inczefi O, Ollé G, Helle K, Róka R, Rosztóczy A. Epidemiologic characteristics of Helicobacter pylori infection in southeast Hungary. World Journal of Gastroenterology. 2019 Nov 14;25(42):6365-6372. doi: 10.3748/wjg.v25.i42.6365. PMID: 31754296; PMCID: PMC6861848.

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II. Helle K, **Bálint L**, Szekeres V, Ollé G, Rosztóczy A. Prevalence of reflux-related symptoms in South-Hungarian blood donor volunteers. PLoS One. 2022 Mar 15;17(3):e0265152. doi: 10.1371/journal.pone.0265152. PMID: 35290403; PMCID: PMC8923446.

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I. Rosztóczy A, Laczkó D, **Bálint L**. Az esomeprazol szerepe a gyomorsav okozta betegségek terápiájában. Háziorvos Továbbképző Szemle. 2013; 18: D5-9.

II. Rosztóczy A, **Bálint L**, Laczkó D. Az esomeprazol szerepe a gyomorsav okozta betegségek terápiájában. Metabolizmus. 2013; 11: L5-8.

III. **Bálint L**, Rosztóczy A. Szimptomatikus diverticulosis, irritábilis bél szindróma (IBS) vagy kivizsgálást igénylő szövődményes állapot? Háziorvos Továbbképző Szemle. 2014; 19: 412-416.

IV. **Bálint L**, Rosztóczy A. Szimptomatikus diverticulosis, irritábilis bél szindróma (IBS) vagy kivizsgálást igénylő szövődményes állapot? Gyógyszerész továbbképzés. 2014; 8(5): 162-166.

INTRODUCTION

Helicobacter pylori (H. pylori) infection is one of the most common chronic human bacterial infections worldwide, affecting up to half of the world's population. This bacterium is the main cause of gastritis, gastroduodenal ulcer, gastric adenocarcinoma, and mucosa-associated tissue lymphoma. International Agency for Research on Cancer (IARC) has classified H. pylori in the first group of carcinogenic agents in 1994. Therefore, the eradication of H. pylori remains a public health concern.

The prevalence of H. pylori has declined worldwide, although wide variation has been observed. In Japan, the prevalence of H. pylori was 90% among individuals born before 1950, but with a subsequent decreasing trend, reaching less than 2% among subjects born after the 2000s. According to a 2017 and a 2018 meta-analysis, the countries with the lowest H. pylori prevalence were Switzerland (13.1-24.7%), Denmark (17.8-26.5%), New Zealand (21.4-26.5%), Australia (17.2-32.1%), and Sweden (18.3-34.1%) in the former meta-analysis, while Indonesia (10.0%), Belgium (11.0%), Ghana (14.2%), and Sweden (15.0%) in the latter. Countries with the highest prevalence were Nigeria (83.1-92.2%), Portugal (84.9-87.9%), Estonia (75.1-90.0%), Kazakhstan (74.9–84.2%), and Pakistan (75.6-86.4%) in the former study, and Serbia (88.3%), South Africa (86.8%), Nicaragua (83.3%), and Colombia (83.1%) in the latter.

In the absence of new, extended multicenter studies with a large number of patients from Central Europe and Hungary, this area's H. pylori prevalence is little known. Four groups of authors from West and North Hungary investigated the prevalence of H. pylori between 1990 and 2000. Their results were similar throughout the country (58.6-63.3%) excluding the capital, in which the prevalence was only 47.3%. In Southeast Hungary, the H. pylori workgroup of our institute conducted a retrospective analysis in 2005 and 2010 among patients with dyspepsia and gastroduodenal ulcer disease. The rate of seropositivity decreased from 46% to 38%. The proposed risk factors for H. pylori infection included male sex, higher age, lower body height, tobacco use, lower socioeconomic status, obesity, and lower educational status of the parents.

Gastroesophageal reflux disease (GERD) is one of the most common gastrointestinal disorders worldwide, which develops when frequent regurgitation of the gastric acid irritates the esophagus, mouth, and/or respiratory system. It is well known that a wide range of symptoms is associated with this chronic condition: typical such as heartburn and acid regurgitation, and atypical symptoms like chronic cough and other respiratory symptoms,

chest pain, dysphagia, globus sensation, nausea, vomiting. GERD is a common clinical problem potentially decreasing quality of life and having a relevant impact on health care costs. Early recognition of symptoms is essential in the prevention of esophageal and extraesophageal complications of GERD.

Large epidemiological studies have shown a global variation in the prevalence of symptomatic GERD. According to a review from 2005, when defined GERD as at least weekly heartburn and/or acid regurgitation, the prevalence in the Western world generally ranged between 10% and 20%, whereas in Asia, the prevalence was reported to be less than 5%. There is a trend for the prevalence in North America to be higher than in Europe, and this trend is also suggested for a higher prevalence in Northern over Southern European countries. Several important sociodemographic and socioeconomic factors are strongly related to both GERD symptoms and its complications, including age, sex, marital status, residence, education level, occupation, obesity, tobacco use, and inversely with H. pylori infection. According to some authors, two major factors could explain the increasing prevalence of GERD symptoms in the Western world: obesity epidemic and the decreasing prevalence of H. pylori-associated gastritis. Studies evaluating the presence or absence of H. pylori in GERD have often given conflicting results.

AIMS

Recent epidemiologic studies have revealed decreases in the prevalence of H. pylori in Western Europe and the United States, and have shown a global variation in the prevalence of symptomatic GERD. Conversely, little is known regarding the prevalence of H. pylori, and GERD-related symptoms in Central Europe, especially in Hungary, where a substantial population resides in rural areas, presumably with lower socio-economic conditions. Therefore, study I aimed to obtain data regarding H. pylori prevalence in Csongrád-Csanád and Békés counties in Hungary, evaluate differences in prevalence between urban and rural areas, and establish factors associated with positive seroprevalence. Study II aimed to identify sociodemographic factors for the presence of GERD-related symptoms in Southeast Hungary and compare the data with the known epidemiologic studies.

PATIENTS AND METHODS

In study I, one-thousand and one healthy blood donors [male/female: 501/500, mean age: 40 (18–65) years] were consecutively enrolled in Csongrád-Csanád and Békés counties. Data collection was performed using an anonymous questionnaire including 26 questions associated with demographic parameters and medical status. Data were collected using a questionnaire at the Hungarian National Blood Transfusion Service in Szeged or Békéscsaba, and at external blood donations in villages of Csongrád-Csanád or Békés county. In Hungary, blood donation is allowed for individuals weighing more than 50 kg and aged 18-65 years. Blood donors are allowed to have some diseases in a well-controlled form.

All subjects were tested for H. pylori IgG antibody positivity using a Platelia H. pylori IgG enzyme-linked immunosorbent assay. For the statistical analysis of different variables related to H. pylori infection, the chi-squared test or two-sample t-test was applied. The association between H. pylori infection and potential risk factors was established via univariate analysis, and odds ratios and 95% confidence intervals were calculated. In addition, a stratified analysis according to age (18–35, 35–50, and 50–65 years) was performed. The final model was developed using a generalized linear regression model via stepwise regression, with inclusion and exclusion criteria set at significance levels of 0.05 and 0.10, respectively. A two-sided p-value < 0.05 was considered statistically significant.

In study II, a total of two-thousand and two blood donor volunteers [male/female: 1156/846, mean age: 39 (18–65) years] were consecutively enrolled. As a number of studies have used questionnaire components to investigate factors possibly associated with GERD, in this study, blood donors completed detailed questionnaires related to demographic data.

The presence and frequency of typical and atypical GERD-related symptoms were assessed. Four symptom-frequency categories were used: at least once a day, at least once a week, at least once a month, and less than once a month. Subgroup analysis was conducted by sociodemographic factors and the prevalence of symptoms. All statistical analyses were performed using R software. Chi-square test was applied as required, and p-value < 0.05 was considered statistically significant.

RESULTS

In study I, the overall seropositivity of H. pylori was 32% in the studied healthy subjects. A significant positive association was observed between age and H. pylori positivity. According to childhood residence, the prevalence of H. pylori was significantly higher in rural areas than in urban areas ($p = 0.0051$). Furthermore, residence in rural areas for at least one year was associated with a significantly higher H. pylori prevalence than continuous urban residency ($p = 0.0003$). Parameters related to occupation were also associated with H. pylori infection. A higher prevalence was established for industrial workers and agricultural workers compared to office workers and non-agricultural workers, respectively. Coffee consumption, pet or domesticated animal rearing, and positive family history of gastric cancer were associated with H. pylori infection as well. Detailed data are shown in Table 1, Table 2, and Table 3.

A significant positive association was observed between age and H. pylori positivity (Table 1). To rule out this strong effect of age, three age groups were formed for further analysis. In the youngest group, the presence of epigastric pain was an independent risk factor for H. pylori positivity. By contrast, animal rearing was a risk factor for the middle age group, and male sex and living in rural areas for at least one year were risk factors in the oldest age group.

In study II, associations between the prevalence of typical and typical and/or atypical GERD-related symptoms occuring at least once a week, or at least once a month, and certain sociodemographic factors are discussed. Among blood donors who had GERD-related symptoms at least weekly, significant correlations were not found between any GERD complaints and childhood residence, current residence, family structure, and occupation. Conversely, among blood donors who had GERD-related symptoms at least monthly, we found significant correlations between typical GERD complaints and living on a farm currently or during childhood. An increased prevalence of GERD-related typical and/or atypical symptoms was shown among housewives and retired blood donors or individuals living on a farm currently. In the group of blood donors who had GERD-related symptoms daily, significant correlations were found between typical and/or atypical GERD complaints and living on a farm during childhood. Detailed data are shown in Table 4, and 5.

Table 1. Sociodemographic factors associated with H. pylori prevalence

Sociodemographic factors	Hp positive		Hp negative					
	n	%	n	%	Total	p	Odds ratio	CI (95%)
Sex						0.0521		
Female	146	29.2	354	70.8	500		1.0	
Male	175	34.9	326	65.1	501		1.3016	[0.9973, 1.6987]
Age						0.000**		
	44.5638	10.7693	37.3599	11.9457			0.9484	[0.9363, 0.9606]
18-25	25	14.9	143	85.1	168			
25-35	32	16.9	157	83.1	189			
35-45	97	34.4	185	65.6	282			
45-55	106	43.6	137	56.4	243			
55+	61	51.3	58	48.7	119			
Current residence						0.0809		
Urban	185	30.0	431	70.0	616		1.0	
Rural	136	35.3	249	64.7	385		1.2725	[0.9706, 1.6683]
Childhood residence						0.0051**		
Urban	140	27.9	361	72.1	501		1.0	
Rural	181	36.2	319	63.8	500		1.4631	[1.1201, 1.9110]
Min. 1 year in rural environment						0.0003**		
Negative	104	25.6	303	74.4	407		1.0	
Positive	217	36.5	377	63.5	594		1.6770	[1.2695, 2.2153]

*: $p < 0.05$, compared to the respective group; **: $p < 0.01$, compared to the respective group

Abbreviations: Hp = Helicobacter pylori; CI = Confidence interval.

Table 2. Socioeconomic and lifestyle factors associated with H. pylori prevalence

Socioeconomic+lifestyle factors	Hp positive		Hp negative					
	n	%	n	%	Total	p	Odds ratio	CI (95%)
Smoking status						0.1121		
Non-smoker	169	29.5	403	70.5	572		1.0	
Smoker	91	34.2	175	65.8	266		1.2400	[0.9090, 1.6915]
Former smoker	61	37.4	102	62.6	163		1.4261	[0.9904, 2.0534]
Alcohol consumption						0.1420		
Never	95	36.0	169	64.0	264		1.0	
Occasional	216	30.3	497	69.7	713		0.7731	[0.5740, 1.0413]
Regular	10	41.7	14	58.3	24		1.2707	[0.5434, 2.9715]
Coffee consumption						0.0390*		
Never	82	26.7	225	73.3	307		1.0	
1	94	36.3	165	63.7	259		1.5632	[1.0929, 2.2358]
More than 1	145	33.3	290	66.7	435		1.3720	[0.9943, 1.8931]
Family structure						0.1649		
Alone	51	39.2	79	60.8	130		1.0	
Adults only	135	31.5	294	68.5	429		0.7113	[0.4736, 1.0683]
Adults and children	135	30.5	307	69.5	442		0.6812	[0.4538, 1.0224]
Occupation						0.0000**		
Physical	186	38.4	299	61.6	485		1.0	
Intellectual	135	26.2	381	73.8	516		0.5696	[0.4355, 0.7450]
Agricultural work						0.0012**		
Negative	140	27.4	371	72.6	511		1.0	
Positive	181	36.9	309	63.1	490		1.5523	[1.1882, 2.0279]
Domestic animals						0.0015**		
Negative	54	23.5	176	76.5	230		1.0	
Positive	267	34.6	504	65.4	771		1.7266	[1.2301, 2.4236]

*: $p < 0.05$, compared to the respective group; **: $p < 0.01$, compared to the respective group

Abbreviations: Hp = Helicobacter pylori; CI = Confidence interval.

Table 3. Factors in patient history associated with H. pylori prevalence

Patient history	Hp positive		Hp negative					
	n	%	n	%	Total	p	Odds ratio	CI (95%)
Family history of HP						0.8829		
Negative	161	32.5	335	67.5	496		1.0	
Positive	18	31.0	40	69.0	58		0.9363	[0.5205, 1.6844]
NA	142	31.8	305	68.2	447			
Family history of GI ulcer						0.3810		
Negative	217	33.3	435	66.7	652		1.0	
Positive	57	29.7	135	70.3	192		0.8464	[0.5965, 1.2009]
NA	47	29.9	110	70.1	157			
Family history of GI cancer						0.0014**		
Negative	277	32.1	587	67.9	864		1.0	
Positive	17	63.0	10	37.0	27		3.6025	[1.6284, 7.9701]
NA	27	33.8	53	66.3	80			
Abdominal pain						0.8108		
Negative	264	32.2	555	67.8	819		1.0	
Positive	57	31.3	125	68.7	182		0.9586	[0.6784, 1.3547]
Epigastrial pain						0.1105		
Negative	214	30.5	487	69.5	701		1.0	
Positive	107	35.7	193	64.3	300		1.2617	[0.9481, 1.6789]

*: $p < 0.05$, compared to the respective group; **: $p < 0.01$, compared to the respective group

Abbreviations: Hp = Helicobacter pylori; CI = Confidence interval; NA = not applicable; GI = gastrointestinal.

Table 4. Sociodemographic factors and GERD-related symptoms

		GERD-related symptoms (typical / atypical) (n = 871)			
	Asymptomatic (n=1,131)	**< 1 / month (n=286)**	**≥ 1 / month& < 1 / week (n=254)**	**≥ 1 / week& < 1 / day (n=191)**	**≥ 1 / day (n=140)**
Family structure					
Alone	161 (14.2%)	37 (12.9%)	36 (14.2%)	17 (8.9%)	14 (10.0%)
Adults only	446 (39.4%)	112 (39.2%)	109 (42.9%)	74 (38.7%)	59 (42.1%)
Adults and	524 (46.4%)	137 (47.9%)	109 (42.9%)	100 (52.4%)	67 (47.9%)
Current residence					
Capital	12 (1.1%)	4 (1.4%)	5 (2.0%)	1 (0.5%)	1 (0.7%)
City	849 (75.1%)	226 (79.0%)	169 (66.5%)	136 (71.2%)	97 (69.3%)
Village	257 (22.7%)	50 (17.5%)	76 (29.9%)	51 (26.7%)	39 (27.9%)
Farm	13 (1.1%)	6 (2.1%)	4 (1.6%)*	3 (1.6%)	3 (2.1%)
Childhood residence					
Capital	16 (1.4%)	4 (1.4%)	4 (1.6%)	1 (0.5%)	2 (1.4%)
City	732 (64.7%)	226 (79.0%)	150 (59.1%)	119 (62.3%)	80 (57.1%)
Village	360 (31.9%)	50 (17.5%)	94 (37.0%)	68 (35.6%)	50 (35.8%)
Farm	23 (2.0%)	6 (2.1%)**	6 (2.4%)	3 (1.6%)	8 (5.7%)*
Occupation					
Student	159 (14.1%)	38 (13.3%)	54 (21.3%)	34 (17.8%)	18 (12.9%)
Office	493 (43.6%)	119 (41.6%)	108 (42.5%)	88 (46.1%)	55 (39.3%)
Agricultural	42 (3.7%)	11 (3.8%)	12 (4.7%)	9 (4.7%)	7 (5.0%)
Industrial	396 (35.0%)	108 (37.8%)	75 (29.5%)	58 (30.4%)	54 (38.6%)
Housewife/retired	41 (3.6%)	10 (3.5%)	5 (2.0%)*	2 (1.0%)	6 (4.3%)

*: $p < 0.05$, compared to the respective group; **: $p < 0.01$, compared to the respective group

Table 5. Sociodemographic factors and GERD-related typical symptoms

		GERD-related typical symptoms (n =559)			
	Asymptomatic (n=1,131)	**< 1 / month (n=229)**	**≥ 1 / month& < 1 / week (n=194)**	**≥ 1 / week& < 1 / day (n=101)**	**≥ 1 / day (n=35)**
Family structure					
Alone	161 (14.2%)	28 (12.2%)	21 (10.8%)	14 (10.3%)	6 (17.2%)
Adults only	446 (39.4%)	95 (41.5%)	79 (40.7%)	57 (41.9%)	16 (45.7%)
Adults and children	524 (46.4%)	106 (46.3%)	94 (48.5%)	65 (47.8%)	13 (37.1%)
Current residence					
Capital	12 (1.1%)	4 (1.7%)	1 (0.5%)	1 (0.7%)	1 (2.9%)
City	849 (75.1%)	173 (75.5%)	126 (64.9%)	106 (77.9%)	28 (80.0%)
Village	257 (22.7%)	49 (21.4%)	63 (32.5%)	27 (19.9%)	6 (17.1%)
Farm	13 (1.1%)	3 (1.4%)	4 (2.1%)*	2 (1.5%)	0 (0.0%)
Childhood					
Capital	16 (1.4%)	6 (2.6%)	2 (1.0%)	1 (0.7%)	1 (2.9%)
City	732 (64.7%)	158 (69.0%)	105 (54.1%)	90 (66.2%)	21 (60.0%)
Village	360 (31.9%)	58 (25.3%)	79 (40.8%)	42 (30.9%)	12 (34.3%)
Farm	23 (2.0%)	7 (3.1%)	8 (4.1%)*	3 (2.2%)	1 (2.9%)
Occupation					
Student	159 (14.1%)	34 (14.8%)	31 (16.0%)	14 (10.3%)	4 (11.4%)
Office	493 (43.6%)	88 (38.4%)	82 (42.3%)	65 (47.8%)	14 (40.0%)
Agricultural	42 (3.7%)	9 (3.9%)	13 (6.7%)	6 (4.4%)	0 (0.0%)
Industrial	396 (35.0%)	95 (41.5%)	63 (32.5%)	47 (34.6%)	14 (40.0%)
Housewife/retired	41 (3.6%)	3 (1.3%)	5 (2.6%)	4 (2.9%)	3 (8.6%)

*: $p < 0.05$, compared to the respective group; **: $p < 0.01$, compared to the respective group

DISCUSSION

H. pylori infection is still the most common human infection worldwide, although on a global scale, its prevalence is decreasing with high geographical variability. In the surrounding Central European countries, such as the Czech Republic and Slovakia, the prevalence of H. pylori infection followed the global trend, decreased from 42% to 23% after 10 years (2001-2011) in the former, from 62% to 35% after 15 years (1992-2007) in the latter. This prospective study proved that the prevalence of H. pylori infection in Hungary has followed international trends, falling to 32% over the last two decades. The Southeastern region of the country was not investigated prospectively before this study, the H. pylori workgroup of our institute conducted a retrospective analysis in 2005 and 2010 among patients with dyspepsia and gastroduodenal ulcer disease. The rate of seropositivity decreased from 46% to 38%.

Having examined the potential factors associated with a higher H. pylori prevalence, our results were in concordance with previous observations revealing a positive linear association with age. An epidemiological survey (2013) from the southern Netherlands reported overall H. pylori seroprevalence of 31.7% in blood donors born between 1935 and 1987. The authors could prove an age-specific decline: the seroprevalence of 48% for donors born between 1935 and 1946 decreased to 16% for those born between 1977 and 1987.

Furthermore, our study supported findings that rural subjects are more likely to be H. pylori-positive than urban residents. Furthermore, a new original finding is that people who lived in rural conditions for at least one year also had an increased risk for H. pylori seropositivity. Meanwhile, the lack of difference in risk between urban and rural residence can be explained by the general improvement of living standards in our country over the last two decades, as most rural people currently have access to water supply and sanitation.

One of the four workgroups from West and North Hungary reported a significantly greater number of seropositive individuals among alcoholics in 1999. The prevalence of H. pylori infection was significantly higher among participants who consumed alcohol daily compared to abstinent ones. Our prospective study could not prove an explicit connection between H. pylori prevalence and alcohol consumption, merely coffee consumption habits and pet or domestic animal rearing. It is well known that H. pylori infection and family history of gastric cancer are the main risk factors for gastric cancer. We have shown that the prevalence of H. pylori infection was significantly higher among blood donors with a family

history of gastric cancer. However, the association between family history of gastric cancer and the risk for H. pylori infection has not been previously widely reported.

The link between epigastric pain and H. pylori seropositivity among young subjects supports the currently accepted, Rome IV diagnostic protocol for functional dyspepsia, which states that excluding H. pylori infection (known as "H. pylori-associated dyspepsia") should be the first step in the presence of such symptoms. Conversely, improved household hygiene in recent decades likely explains the lack of a relationship between socioeconomic status and H. pylori prevalence in this group. The findings further supported the hypothesis that hygiene differences between urban and rural areas were more significant in their childhood than nowadays. In addition, young males had poorer hygiene, than young females at that during childhood.

Our Southeast Hungarian population-based study was the first to establish the sociodemographic features of GERD-related symptoms in Central Europe. Some of the large epidemiological studies and meta-analyses from highly developed countries reported associations between several sociodemographic, and socioeconomic factors and GERD. A study in the UK reported an association between GERD and socio-economic status: GERD was more common among the socially disadvantaged ($p < 0.005$). Each patient provided their occupation and the occupation of their partner, and nine major occupational groups, according to the Standard Occupational Classification (SOC), were assigned. A study conducted in Spain reported that the frequency of GERD symptoms showed an inverse association with educational level. This relationship has been described by American authors too, and probably reflects the action of certain unhealthy lifestyles, habits, or less ability to modify such habits. The other study conducted in the USA detected that heartburn prevalence survey respondents who were not college-educated were more likely to report frequent symptoms compared to individuals with heartburn who were college-educated. A systematic review and meta-analysis investigated the prevalence of GERD according to education level, marital status, and residence. The prevalence of GERD was significantly higher in those with low education compared to those with medium and high education levels. When the pooled prevalence of GERD was stratified according to marital status, divorced/separated/widowed and married individuals were significantly more complainant compared to single ones. Residence also had a significant effect on this connection. The pooled prevalence of GERD in subjects living in urban areas was higher compared to subjects living in rural areas.

As our findings show, there was no evidence of an increased prevalence of GERD-related symptoms among physical workers, individuals living in urban circumstances - neither currently nor in childhood -, and blood donors living in a family compared to single people. In contrast, among the blood donors who had GERD-related symptoms at least monthly, significant correlations were found between typical GERD complaints and living on a farm currently or during childhood. An increased prevalence of GERD-related typical and/or atypical symptoms was shown among individuals living on a farm currently.

The decreasing prevalence of H. pylori infection in developed countries has been paralleled by increased recognition of GERD and its complications. Studies about the exact association between H. pylori and GERD are divisive. Neither in study I: Epidemiologic characteristics of H. pylori infection nor in study II: Sociodemographic features of GERD-related symptoms, typical GERD symptoms were not related to lower prevalence of H. pylori or urban residence with presumably lower infection rate. On the contrary, rural residence has shown an association with GERD-related symptoms, where H. pylori infection is more common. Fundamentally, the evidence for differences in the prevalence of H. pylori infection between patients with or without GERD remains uncertain.

CONCLUSIONS

In conclusion, we proved that in line with the global trends, the prevalence of H. pylori infection has decreased in Southeast Hungary with changes in society, including improvements in socioeconomic status and living standards during recent decades. Meanwhile, the prevalence remains high in the middle-aged and older rural populations. Generally accepted risk factors for H. pylori positivity appeared valid for the studied population, whereas the presence of dyspeptic symptoms was identified as an independent risk factor in the young population. As the prevalence of H. pylori infection is decreasing in Southeast Hungary, an ongoing decline in the age-standardized incidence of gastric cancer may be expected.

The association between the prevalence of GERD-related symptoms among Southeast Hungarian blood donor volunteers and their sociodemographic features could not be as clear as in Western countries. The findings of risk factors are important to developing GERD prevention and improving the quality of life. Knowledge of these factors can greatly assist clinicians in recognizing the symptoms of GERD in patients who are most at risk of developing complications.

NEW RESULTS ESTABLISHED IN THE THESIS

The prevalence of H. pylori infection has decreased in Southeast Hungary in line with the global trends. A significant positive association was observed between age and H. pylori positivity. According to childhood residence, the prevalence of H. pylori was significantly higher in rural areas than in urban areas. Furthermore, residence in rural areas for at least one year was associated with a significantly higher H. pylori prevalence than continuous urban residency. Parameters related to occupation, coffee consumption, pet or domesticated animal rearing, and positive family history of gastric cancer were associated with H. pylori infection. The presence of dyspeptic symptoms was identified as an independent risk factor in the young population. Among blood donors who had GERD-related symptoms at least monthly, we found significant correlations between typical GERD complaints and living on a farm currently or during childhood. In the group of blood donors who had GERD-related symptoms daily, significant correlations were found between typical and/or atypical GERD complaints and living on a farm during childhood.

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1.sz. melléklet

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Alulírott……**Dr. Helle Krisztina**.....(felelős társszerző) kijelentem, hogy …**Dr. Bálint Lenke**...(pályázó) PhD értekezésének tézispontjaiban bemutatott - közösen publikált - tudományos eredmények elérésében a pályázónak meghatározó szerepe volt, ezért ezeket a téziseket más a PhD fokozat megszerzését célzó minősítési eljárásban nem használta fel, illetve nem kívánja felhasználni.

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