

ORIGINAL PAPER

The environmental factors and *Helicobacter pylori* infection in children

Leokadia Bąk-Romaniszyn^{1,2}, Izabela Mękarska-Paradowska³,
Izabela Płaneta-Matecka¹

Abstract

Introduction: *Helicobacter pylori* (*H. pylori*) infection is a world problem. It occurs in children and adults and concerns half population of the whole world. In developing countries *H. pylori* infection concerns from 80 even to 100% of the population and in countries of high level of economic development oscillates from 20 to 50%. **The aim** of the study was the evaluation of environmental conditions and hygienic habits of children with *H. pylori* infection. **Material and methods:** 302 children, aged 0,25-18 years (mean 10,1+/-5,3), 166 girls and 136 boys. A questionnaire concerning the socioeconomic conditions of the child's family, hygienic habits, bacterial and parasitic infections. Serum level of anti-*H. pylori* antibodies IgG class was assessed with ELISA. **Results:** *H. pylori* (Hp+) infection was diagnosed in 37,1% of children. Living and sanitary conditions (ere similar in both groups: 54,6% children lived in apartments, 43,4% in houses and 2% in a tenement. In the group of *H. pylori*-seropositive children a greater number of adult household members was observed, even 9 (p<0,05). However, in the Hp-group the metric area per person was significantly larger (p<0,01). In 87,4% investigated subjects economic conditions were determined to be good, in 3,6% to be bad (Hp+ vs. Hp- NS), but in Hp+ group there were more families lacking money for covering the cost of living (rent, drugs). Infected children significantly less frequently washed their hands before meals than non-infected children (57,7% vs. 69,9%, p<0,05) as well as after returning home, using toilet, contact with animals, and more frequently ate unwashed fruit (28,6% vs. 11,1%, p<0,001). Family history of peptic ulcer disease was observed more often in children Hp(+) than Hp(-) (29% vs. 15,8%, p<0,05). **Conclusions:** In the families of children with *H. pylori* infection low socioeconomic conditions were observed and these children had bad hygienic habits. (*Clin Exp Med Lett* 2009; 50(3):127-130)

Keywords: *Helicobacter pylori*, children, environmental conditions, hygienic habits

Introduction

Helicobacter pylori (*H. pylori*) infection is a world problem. It occurs in children and adults and concerns half population of the whole world and the number of the infected increases on the average by 0,5-1,0% a year [1-5]. In developing countries *H. pylori* infection concerns from 80 even to 100% of the population. In countries of high level of economic development the percentage of the infected with this bacterium oscillates from 20 to 50%. Poland belongs to countries of medium prevalence of *H. pylori* infection, from 40 to 70% in adults and on the average in 31% of children [6,7]. Epidemiologic data related to *H. pylori* infection in children differ dependently on the country they come from. In literature there is a consensus of opinions as regards the increase of the prevalence of the infection with age.

The epidemiologic chain of *H. pylori* infection has not been recognized so far. There comes to infection via digestive tract. Various modes of bacteria transmission are considered in which there comes to contact with an infected human host, animal or foodstuffs [1,3,4,6]. The following modes of transmission are suggested: mouth-mouth or oral-rectal by consuming foodstuffs

contaminated with excrements, particularly vegetables and water and the possibility of infection by a contact an animal – a human in professions such as: a vet, a breeder, a farmer. The most probably oral cavity, mainly periodontal pockets can be the bacteria reservoir and the source of infection. There may live spore coccoidae forms which after reaching the digestive tract activate in the stomach.

The influence of bad socioeconomic and hygienic conditions on the prevalence of *H. pylori* infection has been emphasized [1,4,6,8,9].

The aim of the study was the evaluation of environmental conditions and hygienic habits of children with *H. pylori* infection.

Material and methods

The analysis comprised 302 children and adolescents aged from 4 months to 18 years (mean 10,1 +/- 5,3 years), 166 girls and 136 boys.

The questionnaire (89 questions) was filled in by parents, concerning the socioeconomic conditions of the child's family (living, economic, nutritional, sanitary,

Submitted: 02.06.2009; corrected: 24.08.2009; accepted: 27.08.2009

¹Department of Gastroenterology, Polish Mother's Memorial Hospital Research Institute, Lodz, Poland

²Department of Pediatrics, Preventive Cardiology and Clinical Immunology, Medical University, Lodz, Poland

³Darmed Medical Centre, Piotrków Trybunalski, Poland

Correspondence address:

Leokadia Bąk-Romaniszyn

Department of Gastroenterology, Polish Mother's Memorial Hospital Research Institute, 281/289 Rzgowska Str., 93-338 Lodz, Poland; Phone: (+48 42) 271-20-64; Fax: 042 271-13-94; E-mail: kpg@iczm.p.edu.pl

contacts with animals), hygienic habits, bacterial and parasitic infections. Serum level of anti- *H.pylori* antibodies IgG class was assessed with ELISA (Recom Well Helicobacter IgG, Mikrogen, Germany).

Statistical analysis

The obtained results were subjected to statistical analysis with the use of the test of two fractions comparison at the level of significance $p < 0,05$.

Ethics Committee

The study was approved by the Polish Mother's Memorial Hospital Research Institute Ethics Committee. The parents were informed about the aim of the study and their written consent was obtained.

Results

Basing on serological investigations *H.pylori* infection was diagnosed in 112 (37,1%) children (Hp+group) and

Table 1. Characteristics of the examined group

Adult person in family	All examined N = 302		Group Hp+ N = 112		Group Hp- N = 190		p
	n	%	n	%	n	%	
1	8	2,6	3	2,7	5	2,6	ns
2	205	67,9	66	58,9	139	73,2	$p < 0,05$
3	53	17,5	27	24,1	26	13,7	$p < 0,05$
4	29	9,6	11	9,8	18	9,5	ns
5	4	1,3	2	1,8	2	1,1	ns
6	3	1,0	3	2,7	0	0,0	ns
mean	2,4		2,6		2,3		ns

Table 2. Living and economic conditions of the investigated children

	All examined N = 302		Group Hp+ N = 112		Group Hp- N = 190		p
	n	%	n	%	n	%	
social conditions							
good	264	87,4	94	83,9	170	89,5	ns
middle	25	8,3	11	9,8	14	7,4	ns
bad	11	3,6	7	6,3	4	2,1	ns
no answer	2	0,7	-	-	2	1,1	ns
area per person							
< 5 m ²	4	1,3	3	2,7	1	0,5	ns
5-10 m ²	25	8,3	15	13,4	10	5,3	$p < 0,05$
> 10m ²	273	90,4	94	83,9	179	94,2	$p < 0,01$
sanitary conditions							
access to top water	299	99,0	111	99,1	188	98,9	ns
well	2	0,7	1	0,9	1	0,5	ns
sewage system	285	94,4	107	95,5	178	93,7	ns
cesspit	15	5,0	4	3,6	11	5,8	ns
levatory	1	0,3	0	0,0	1	0,5	ns
hygienic habits							
wash hands							
after returning home	166	57,4	58	55,8	108	58,4	ns
before eating	189	65,4	60	57,7	129	69,7	$p < 0,05$
after toilet	174	60,2	59	56,7	115	62,2	ns
after contact with animals	128	44,3	40	38,5	88	47,6	ns
tooth brushes							
only myself	287	99,3	102	98,1	185	100,0	ns
used someone	2	0,7	2	1,9	0	0,0	ns
nutrition habits – eating fruits and vegetables							
washed	249	82,5	80	71,4	169	88,9	$p < 0,001$
unwashed	53	17,5	32	28,6	21	11,1	$p < 0,001$

excluded in 190 (62,9%) (Hp-group). In both groups older children - over 10 years of age - predominated: in Hp(+) group 67 (60%) children and in Hp(-) group -105 (55%). Girls predominated insignificantly in both the investigated groups: respectively 63 (56,3%) and 103 (54,2%).

Living and economic conditions of the investigated children and their families

The majority - 137 (45%) of the investigated - were from families of traditional model: 2 adults and one or two children. A greater number of adults household members was observed in the group of *H. pylori* seropositive children ($p < 0,05$) (Table 1).

Living and sanitary conditions (access to tap water in 99%, sewage system in 94,4%) were similar in both groups: 165 (54,6%) children lived in apartments, 31 (43,4%) in houses and 6 (2%) in a tenement house; 273 (90%) lived in large apartments where the area per person was over 10 m². However, in the Hp(-)group the metric area per person was significantly larger ($p < 0,01$) (Table 2).

In 264 (87,4%) investigated subjects economic conditions were determined to be good, in 11 (3,6%) to be bad (Hp+ 83,9% vs. Hp- 89,5%, NS), but in Hp(+) group there were more families lacking money for covering the cost of living (rent, drugs or clothes) (Figure 1).

Hygienic habits

Infected children significantly less frequently washed their hands before meals than non-infected children (57,7% vs. 69,9%, $p < 0,05$) as well as after returning home, using toilet, contact with animals. Only in Hp(+) group 2 (1,9%) children used someone else's toothbrushes. Also Hp(+) children were more frequently eating unwashed fruit (28,6% vs. 11,1%, $p < 0,001$) (Table 2).

Contact with animals

Contact with animals, both with pets and farm animals, was similarly frequent and did not affect the occurrence of *H. pylori* infection (Hp+ 53,6% vs. Hp- 55,8%, NS).

Family history

Family history of peptic ulcer disease was observed more often among parents of *H. pylori* seropositive children 28 (29%) than in Hp(-) children 30 (15,8%) ($p < 0,05$).

Discussion

In the investigated group serological traits of *H. pylori* infection were observed in 37% of children and the percentage was higher than the average obtained in all-Poland studies [7]. Environmental and regional conditionings affect undoubtedly the prevalence of *H. pylori* infection. In Poland the prevalence of this infection in children is about 32% and demonstrates regional diversity from 20% in Wielkopolska province to 37% in Lodz province. The studies carried out in Lodz macroregion demonstrated that the prevalence of *H. pylori* infection up to 2 years of age is 28%, in the age group from 4 to 6 years - 32%, from 6 to 10 years - 30% and in school age and adolescence 41-45% [2,7]. As it results from these observations, the percentage of the infection largely depends on the age of the examined and is probably associated with longer exposure to the infection, but also with poor sanitary and epidemiologic conditions at the place of birth [4,5]. It results from the literature data that rural, town and small-town environment particularly predispose to *H. pylori* infection [7,8].

Dore et al. demonstrated higher prevalence of the infection in big families [8]. Own studies also confirmed that the frequency of occurrence of this infection increased together with the increase of the number of adult

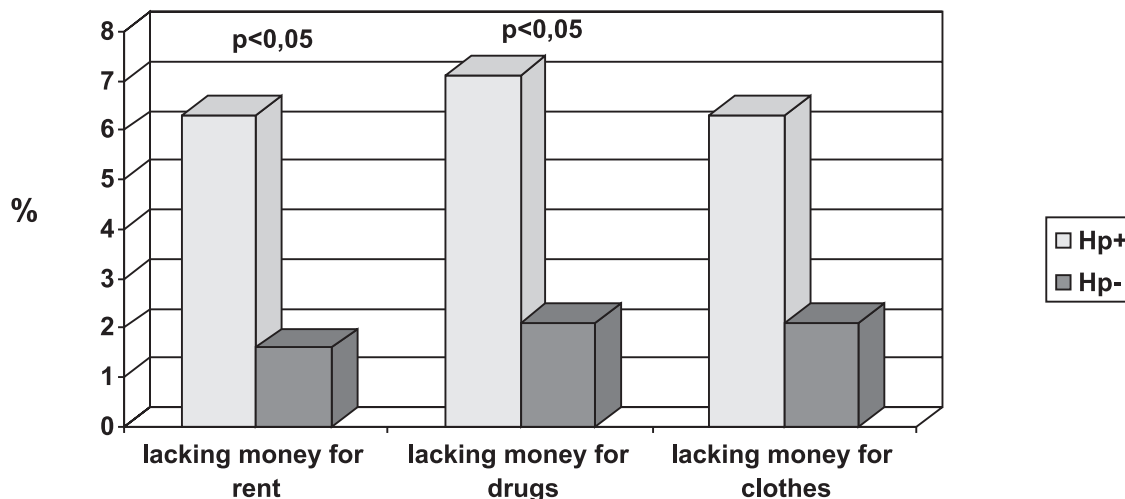


Figure 1. Economic status examined children family

household members. Socioeconomic factors as well as hygienic habits exert a significant influence on the spreading of the *H.pylori* infection. Low socioeconomic level, poor sanitary conditions, improper hygienic habits and overpopulation are factors associated with high prevalence of the infection [4,8,10]. Furthermore, families of many household members, poor living conditions with small metric area per person and sharing one bed also increase the prevalence of the infection [10-12]. Lack of sewage system and access to tap water, not observing hygiene play a significant role in the spreading of the infection [3,4,8]. Lack of the habit of washing hands before meals, after using toilet, after the contact with animals, eating unwashed fruit and vegetables, using someone else's toothbrush are not of insignificance for the spreading of the infection and we had such a group of infected children in our study. *H.pylori* infection affects more frequently family members and agglomerations of low economic status [7,9,11].

A particularly high prevalence of *H.pylori* infection was demonstrated in children from a children's home; in an orphanage in Bangkok Blaser found *H.pylori* infection in over 70% of children to 2 years of age and in a study in Lodz *H.pylori* infection was detected in 100% of residents over 10 years of age. In the hereby presented study *H.pylori* infection was also more frequently observed in poorer families lacking money for covering the cost of a rent, buying drugs or clothes.

Peptic ulcer disease was observed more often among the parents of *H.pylori*-seropositive children. In previous studies high prevalence of *H.pylori* infection (75%) had been also noted in families of children in whom chronic gastritis with or without peptic ulcer disease was diagnosed [1]. These observations may point to intrafamilial transmission of *H.pylori* infection.

Conclusion

In the families of children with *H.pylori* infection low socioeconomic conditions were observed and these children had bad hygienic habits.

References

1. Płaneta-Malecka I, Czkwianianc E, Bąk-Romaniszyn L, Plewińska M. Zakażenie *Helicobacter pylori* u dzieci, jego następstwa i leczenie. *Med Sc Rev Gastroenterol* 2002; 1: 5-17.
2. Bąk-Romaniszyn L, Płaneta-Malecka I, Mękarska-Paradowska I, Trojanowska-Lipczyk J. Czynne zakażenie *Helicobacter pylori* u dzieci z dodatnim mianem przeciwciał anti-*H. pylori*. *Stand Med* 2003; 5: 92-5.
3. Misiewicz JJ. *Helicobacter pylori* comes of age. *Gastroenterol Pol* 1994; 1: 203-8.
4. Hassal E. *Helicobacter pylori* infection in children. W: *Helicobacter pylori*. Basic mechanisms to Clinical Cure 2000. Kluwer Academic Publisher; 2000: 575-85.
5. Rowicka G. Choroba wrzodowa. *Kl Ped* 2000; 8: 533-5.
6. Dzieńszewski J, Jarosz M i Grupa Robocza PTG. Postępowanie w zakażeniu *Helicobacter pylori* (rok 2008). Wytyczne opracowane przez Grupę Roboczą Polskiego Towarzystwa Gastroenterologii. *Gastroenterol Pol* 2008; 15: 323-31.
7. Iwańczak F, Maciorkowska E, Kaczmarski M, Bąk-Romaniszyn L, Płaneta-Malecka I, Romańczuk W, et al. Badania epidemiologiczne częstości występowania zakażenia *Helicobacter pylori* u dzieci w Polsce. *Pediatr Współczesna* 2004; 4: 345-50.
8. Dore MP, Malaty HM, Graham DY. Risk factor associated with *Helicobacter pylori* infection among children In a defined geographic area. *Clin Infect Dis* 2002; 35: 240-5.
9. Bąk-Romaniszyn L, Płaneta-Malecka I, Janakowski A, Mękarska-Paradowska I. Zakażenie *Helicobacter pylori* w skupiskach dziecięcych makroregionu łódzkiego. *Lek Wojskowy* 1999; 2: 52-5.
10. Zielińska-Duda H, Czerwonka-Szaflarska M, Zielińska I. Analiza rozwoju fizycznego dzieci i młodzieży z zakażeniem *Helicobacter pylori*. *Pediatr Pol* 2007; 82: 395-402.
11. Czerwonk-Szaflarska M, Parzęcka M. Rodzinne występowanie zakażenia *Helicobacter pylori*- aktualny stan wiedzy. *Pediatr Pol* 2006; 81: 679-83.
12. Czkwianianc E, Bąk-Romaniszyn L, Durko A, Krawczyk J, Płaneta-Malecka I, Malecka-Panas E. Badania epidemiologiczne w aspekcie uwarunkowań środowiskowych zakażenia *H.pylori* w Łodzi i województwie łódzkim. *Polish J Environ Stud* 2006; 15(5b): 241-4.