Prevalence of *Helicobacter Pylori* Infection among Children in Rasht, Northern Iran

F Mansour-Ghanaei*, M Yousefi Mashhour, F Joukar, M Sedigh, AH Bagher-Zadeh, R Jafarshad

Gastrointestinal and Liver Diseases Research Center (GLDRC) Gilan University of Medical Sciences, Rasht, Iran

ABSTRACT

BACKGROUND

Helicobacter pylori (H. pylori) infection usually occurs during childhood, especially in developing countries. The aim of this study was to evaluate the prevalence of H. pylori infection among children in primary schools of Rasht, a northern Iranian city.

METHODS

This cross-sectional study was conducted among 961 primary school students in Rasht. Samples were randomly selected and stored at -20^{oC} until analysis. The stool assay was performed using the HP AgT kit.

RESULTS

Overall 475 boys and 486 girls, aged 7 to 11 years were evaluated. A total of 384 (40%) children were diagnosed as H. pylori positive by the stool test. A higher prevalence of H. pylori was found in the stools of individuals who consumed well water and municipal tap water when compared to boiled water (p<0.05). There was no significant difference between the rate of *H. pylori* infection and individuals' ages, gender or socioeconomic levels.

CONCLUSION

The results of this study suggest that the source of drinking water may play a role in transmission of *H. pylori*. Transmission can be minimized with the use of boiled or mineral water.

KEYWORDS

Helicobacter pylori; Stool exam; Iran; Prevalence; Children

INTRODUCTION

Helicobacter pylorus (*H. pylori*) is now presumed to be one of the most important factors in the pathogenesis of upper gastrointestinal diseases.[1] Eradication of *H. pylori* would have profound significance for the treatment of many gastroduodenal disorders.[2] *H. pylori* infection mainly happens during early child hood, especially in developing counries.[3,4] There are conflicting data on the association between *H. pylori*, abdominal pain and a positive family history of dyspepsia.[5]

H. pylori infection is usually acquired during the early years of life and persists for several years.

*Corresponding Author:
Fariborz Mansour-Ghanaei, MD
Professor of Gastrointestinal and Liver Diseases Research Center (GLDRC), Gilan University of Medical Sciences, Sardar-Jangle Ave., Razi Hospital, PO Box 41448-95655, Rasht, Iran.
Tel: + 98 131 5535116
Fax: +98 131 5534951
E-mail: ghanaei@gums.ac.ir
Received: 30 October 2008
Accepted: 30 March 2009

The prevalence of *H. pylori* infection has been reported to increase with age.[6] It seems to be an association between the prevalence of *H. pylori* in adults and the risk of acquisition of *H. pylori* infection during childhood.[7] Further studies of *H. pylori* infection in children may lead to a better understanding of the disease process.

Scant information is available within specific pediatric populations as compared with adults, and the prevalence of *H. pylori* at both gastric and non-gastric sites within children does not appear to have been studied.

The aim of this study is to evaluate the prevalence of H. pylori infection among children in primary schools because these children have close-contacts and are prone to unclear transmission routes. Therefore we have studied primary school children in Rasht, a city in northern Iran.

MATERIALS AND METHODS

This cross-sectional study was conducted from September to December 2007 in primary schools of Rasht, the capital of Gilan Province. There were 961 participants selected with multistage random sampling from four locations within the city.

Initially, 20 schools from all sections of Rasht were considered as a cluster; then primary students were classified into four age groups. Finally, within each group, cases were randomly selected: 250 cases from age group 7-8 years, 241 cases from 8-9 years, 250 cases from 9-10 years and 220 cases from the 10-11 year old group.

Invitation cards were given to the parents of the selected groups and they were asked to attend the schools at a preselected time. Demographic data were obtained from children's parents including: educational level, socioeconomic status (relative to monthly salary), number of family members and place of residence. Parents were asked about their children's drinking water source (well water, municipal tap water, boiled water or mineral water). Healthy cases with no gastrointestinal symptoms and no history of antibiotic treatment during the previous one month were selected to participate. The fecal antigen test was used to detect *H. pylori* antigen. Stool samples were collected as soon as possible (up to 1 hour after collection). The stool assay was performed using the HP AgT kit (Genesis Diagnostics, Littleport, Cambridgeshire, England) which is a qualitative test with a poly-clonal rabbit anti-*H. pylori* antibody.

The samples were frozen at -20^{oC} prior to analysis. This test has a sensitivity of 92% and specificity of 96%.[6] Infection was determined based on the antigen immunoassay in stool by enzyme-linked immunosorbant assay (ELISA).

Data were analyzed by x^2 and Fisher's exact test. $P<0.05$ was considered statistically significant.

RESULTS

Out of 961 selected cases 239 were from urban and 722 were from rural areas. There were 475 boys versus 486 girls (Table 1). The prevalence rate of *H. pylori* infection was 40% (384 out of 961). Among *H. pylori* positive cases; 191 (49.7%) were boys and 193 (50.3%) were girls, which was not statistically significant.

There were no significant differences between *H. pylori* infection rate and individuals' place of residence, age group, socioeconomic level and parents' educational levels in this study (Table 1).

Domestic water supplies were: well water in 14.9% (143 cases), mineral water in 20.2% (194 cases), refined municipal tap water in 47.7% (458 cases) and boiled water in 17.3% (166 cases) of those studied. Evaluation of drinking habits indicated a higher prevalence of *H. pylori* in individuals that used municipal tap or well water when compared to those who consumed boiled water ($p<0.05$; Figure 1)

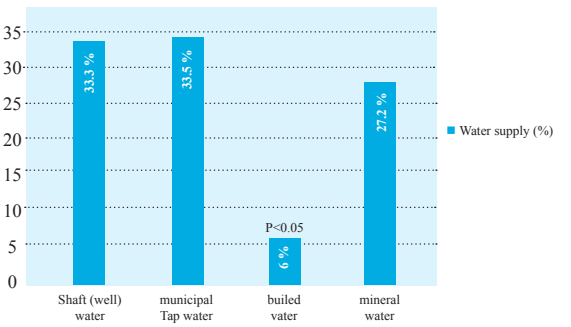

Fig. 1: Distribution of domestic water supply (well water, municipal tap water, boiled water, mineral water) in H. pylori positive children.

Table 1: Distribution of H. pylori among study variables.

Variable		Positive N=384 (%)	Negative N=577 (%)	*p*-value
Sex	Male (475)	191 (40/2)	284 (59/8)	NS
	Female (486)	193 (39/7)	293 (60/3)	
Age (years)	7-8 (250)	98 (39/2)	152 (60/8)	
	8-9 (241)	95 (39/4)	146 (60/6)	
	9-10 (250)	95 (38/0)	155 (62/0)	NS
	10-11 (220)	96 (43/6)	124 (56/4)	
Residence	City (722)	283 (39/2)	439 (60/8)	NS
	Urban (239)	101 (42/2)	138 (57/8)	
Number of family members	<4 (654)	255 (39/0)	399 (61/0)	NS
	4-6 (221)	97 (43/9)	124 (56/1)	
	≥7 (86)	32 (37/2)	54 (62/8)	
Fathers' education	Illiterate (37)	16 (43/2)	21 (56/8)	NS
	Academic (770)	313 (40/6)	457 (59/4)	
	Non-academic (154)	55 (35/7)	99 (64/3)	
Mothers' education	Illiterate (32)	14 (43/7)	18 (56/3)	NS
	Academic (848)	321 (37/8)	495 (62/2)	
	Non-academic (113)	49 (43/4)	64 (56/6)	
Socioeconomic status*	Under poverty line (314)	93 (29/6)	221 (70/4)	NS
	Above poverty line (647)	291 (45/0)	356 (55/0)	

*Monthly salary of $200 was considered to be the poverty line.

DISCUSSION

Prevalence of *H. pylori* in children ranges from less than 10% to greater than 80% in otherwise healthy individuals and is dependant upon age, socioeconomic class and country of origin.[7]

H. pylori infection has been associated with gastritis, duodenal ulcer, gastric cancer and mucosa–associated lymphoid tissue (MALT) lymphoma.[8]

Although endoscopy-based tests are the methods of choice for the diagnosis of active *H. pylori* infection, their application in children is quite difficult and unpleasant. Moreover in developing regions, for socioeconomic reasons, most infected children are not diagnosed or treated for *H. pylori* infection. To circumvent these difficulties, a reliable noninvasive test for children is required.

Among the noninvasive methods, serological tests can not be applied to young children because of low sensitivity. In addition, the 13C urea breath test is cumbersome, expensive, unavailable test in certain countries and is not reliable in very young children.[9]

Therefore, a low-cost, rapid diagnostic technique may be useful for the detection of *H. pylori* infection in children who reside in developing countries. The *H. pylori* stool antigen test is noninvasive, simple, relatively inexpensive and a reliable assay in the diagnosis of *H. pylori* infection in both adults and children[10-14] and, therefore, this test was used in this study.

The prevalence of *H. pylori* infection in southern Iran is very high. In Shiraz, a city located in the south of Iran, 593 stool samples were collected from children with prevalence rates of 82%, 98%, 88%, 89%, and 57% in age groups of 9 months, as well as 2, 6, 10, and 15 years of age, respectively.[14] We collected 593 stool samples from children and infection was determined based on antigen immunoassay

in stool using the enzyme-linked.

The prevalence rates were 82%, 98%, 88%, 89% and 57% in age groups of 9 months and 2.6 years. In a similar survey in Tehran that tested 430 children and adolescents, 47% were positive by the stool Ag test.[15] In this study, the prevalence of *H. pylori* infection was 39.2%, 39.4%, 38.0% and 43.6% among various age groups, with no significant difference between them.

In some studies a significant association of *H. pylori* with male gender was seen.[16] In both Spain and Japan, the prevalence was significantly higher in boys ($p<0.01$).[16,17] In this study, as with many other surveys in our country,[14,15,18] there was no significant difference between the prevalence of *H. pylori* infection and gender.

The rate of *H. pylori* infection was also not found to be related to gender in Taiwan, Korea, and Mexico.[19-21] A study in Argentina has shown that mothers' educational levels rather than the fathers, was a significant factor in the childrens' infection rates.[22]

Although in our study, there was no relationship between mothers' education and prevalence of *H. pylori* infection. The Results of surveys in Switzerland, Scotland, Brazil, Argentina and a multicenter European study have revealed that socioeconomic level is a risk factor for *H. pylori* infection.[22-26]

Low socioeconomic status and poor sanitary standards have been described as risk factors for the acquisition and transmission of *H. pylori*.[27]

The prevalence of *H. pylori* infection in Korea appears to vary with markedly lower prevalence in children from families of higher socioeconomic status.[20] A survey in Tehran has shown that the poor socioeconomic status of people in southwest Tehran, correlated with a higher incidence of infection ($p<0.05$).[15]

In our study, however, there was no significant difference in any socioeconomic levels which possibly may be due to the lack of a suitable index for analysis of this factor. The incidence of *H. pylori* infection is determined by the type of residence, family size, water consumption and personal hygiene.[28]

In our study there was no significant difference between the prevalence of *H. pylori* infection and the number of persons per household.

An earlier study has shown that water supplies are vulnerable to bacterial contamination.[29]

The results of this study suggests that an important pathway for *H. pylori* transmission can be through the consumption of well water or municipal tap water. By drinking boiled as well as mineral water we can minimize the chances of *H. pylori* transmission. However, in order to consider well water and municipal tap water as sources of infection, more research should be conducted.

ACKNOWLEDGMENTS

We would like to thank Dr. Maryam Jamali for her cooperation and Dr. Afra and his laboratory staff for supporting our work and providing the laboratory kits used in this study.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Ahmad KS, Khan AA, Ahmed I, Tiwari SK, Habeeb MA, Ali SM, et al. Prevalence study to elucidate the transmission pathway of Helicobacter pylori at oral and gastoduodenal sites of a South Indian population. *Singapore Med J* 2006; **47(4)**:291.

2. Goodman KJ, Corea P. Helicobacter pylori infection in the Colombian Andes: a population based of transmission pathways. *Am J Epidemiol* 1996;**144(3)**:290-9.

3. Ozen H, Dinler G, Aky.n Y. Helicobacter pylori infection and recurrent abdominal pain in Turkish children. *Helicobacter* 2001;**6(3)**:234-8.

4. Ashorn M, Maki M, Hallstr.m M. Helicobacter pylori infection in Finnish children and adolescents. *Scand J Gastroenterol* 1995;**30(9)**:876-9.

5. Us D, Hasçelik G. Seroprevalance of *Helicobacter pylori* infection in an asymptomatic Turkish population. *J Infect* 1998;**37(2)**:148-50.

6. Gisbert JP, Pajares JM. Diagnosis of *Helicobacter pylori* by stool antigen determination: a systematic review. *Am J Gastroenterology* 2001;**96(10)**:2829-38.

7. Peterson WL, Graham DY. *Helicobacter pylori*. In: Feldman Sleiseneger MH, ed. Sleiseneger and Ford Trans Gastrointestinal and Liver Disease: Pathophysiology, Diagnosis, Management. 8thed. Philadelphia:*WB Saunders Company* 2006:732-49.

8. Torres J, Perez- Perez G, Goodman KJ, Atherton JC, Gold BD, Harris PR, et al. A comprehensive review of the natural history of Helicobacter pylori infection in children. *Arch Med Res* 2000;**31(5)**:431-69.

9. Megrau F. Comparison of non-invasive tests to detect *Helicobacter pylori* infection in children and adolescents: results of a multicenter European study. *J Pediatr* 2005; **146(2)**:198–203.

10. Andrew J, Marsden B, Brown D, Wong VS, Wood E, Kelsey M. Comparison of three-stool antigen tests for *Helicobacter pylori* detection. *Clin Pathol* 2003;**56**:769–71.

11. Braden B, Posselt HG, Ahrens P, Kitz R, Dietrich CF, Caspary WF. New immunoassay in stool provides an accurate noninvasive diagnosis method for *Helicobacter pylori* screening in children. *Pediatrics* 2000;**106 (1 pt1)**:115–7.

12. Kato SK, Ozawa M, Okuda T, Fujisawa T, Kagimoto S, Konno M, et al. Accuracy of the stool antigen test for the diagnosis of childhood *Helicobacter pylori* infection: a multicenter Japanese study. *Am J Gastroenterol* 2003;**98(2)**: 296–300.

13. Koletzko SN, Konstantopoulos D, Bosman A, Feydt-Schmidt A, Van der Ende N, Kalach J, et al. Evaluation of a monoclonal enzyme immunoassay for detection of *Helicobacter pylori* antigen in stool from children. *Gut* 2003;**52(6)**:804–6.

14. Alborzi A, Soltani J, Pourabbasi B, Oboodi B, Haghighat M, Hayati M, et al. Prevalence of *Helicobacter pylori* infection in children (south of Iran). *Diagn Microbiol Infect Dis* 2006;**54(4)**:259-61.

15. Falsafi T, Valizadeh N, Sepehr S, Najafi M. Application of a stool antigen test to evaluate the incidence of *Helicobacter pylori* infection in children and adolescents from Tehran, Iran. *Clin Diagn Lab Immunol* 2005;**12(9)**:1094–7.

16. Bohmer CJ, Klinkenberg-Knol EC, Kuipers EJ, Niezen-de Boer MC, Schreuder H, Schuckink-Kool F, et al. Prevalence of Helicobacter pylori infection among inhabitants and healthy employees of institutes for the intellectually disabled. *Am J Gastroenterol* 1997;**92(6)**:1000-4.

17. Leandro Liberato SV, Hernandez Galindo M, Torroba Alvarez L, Sanchez Miramon F, Leandro Ciriza SE, Gomez Abadia A, et al. *Helicobacter pylori* infection in children population in Spain: prevalence, related factors and influence on growth. *An Pediatr (Barc)* 2005;**63(6)**:489-94.

18. Mahram M, Ahmadi F. Seroprevalence of *Helicobacter pylori* infection among 7-9 year-old in Zanjan-2004. Journal of Research in Medical Sciences.*(correct abbreviation according to index medicus?)* 2006;**11(5)**:297-301.

19. Lin DB, Nieh WT, Wang HM, Hsiao MW, Ling UP, Changlai SP, et al. Seroepidemiology of *Helicobacter pylori* infection among preschool children in Taiwan. *Am J Trop Med Hyg* 1999;**61(4)**:554-8.

20. Malaty HM, Kim JG, Kim SD, Graham DY. Prevalence of *Helicobacter pylori* infection in Korean children: inverse relation to socioeconomic status despite a uniformly high prevalence in adults. *Am J Epidemiol* 1996;**143(3)**:257-62.

21. Jimenez-Guerra F, Shetty P, Kurpad A. Prevalence of and risk factors for *helicobacter pylori* infection in school children in Mexico. *Ann Epidemiol* 2000;**10(7)**:474.

22. Daniel M, Miria G. *Helicobacter pylori* infection in children from Northeast Argentina: seroprevalence and its relation with nutritional status and socio-sanitary conditions. *Inf Emerg* 2002;**4(1)**:24-9.

23. Heuberger F, Pantoflickova D, Gassner M, Oneta C, Grehn M, Blum AL, et al. *Helicobacter pylori* infection in Swiss adolescents.Prevalence and risk factors. *Eur J Gastroenterol Hepatol* 2003;**15(2)**:179–83.

24. Malcolm CA, Mackay W G, Shepherd A, Weaver LT. *Helicobacter pylori* in children is strongly associated with poverty. *Scott Med J* 2004;**49(4)**:136–8.

25. Megraud F. Comparison of non-invasive tests to detect *Helicobacter pylori* infection in children and adolescents: results of a multicenter European study. *J Pediatr* 2005; **146(2)**:198–203.

26. Rodrigues MN, Queiroz DM, Bezerra Filho JG, Pontes LK, Rodrigues RT, Braga LL. Prevalence of *Helicobacter pylori* in children from an urban community in north-east Brazil and risk factors for infection. *Eur J Gastroenterol Hepatol* 2004;**16(2)**:201-5.

27. Goldman C, Barrado A, Janjetic M, Balcarce N, Cueto Rua E, Oshiro M, et al. Factors associated with *H. pylori* epidemiology in symptomatic children in Buenos Aires, Argentina. *World J Gastroenterol* 2006;**12(33)**:5384-8.

28. Maciorkowska E, Ciesla JM, Kaczmarski M. *Helicobacter pylori* infection in children and socio-economic factors. *Przegl Epiemiol* 2006;**60 Suppl 1**:68-75.

29. Klein PD, Graham DY, Gaillour A, Opekun AR, Smith EO. Water source as risk factor for *Helicobacter pylori* infection in Peruvian children. Gastrophysiology Working Group. *Lancet* 1991;**337(8756)**:1503-6.