

# *Helicobacter Pylori* Infection: We Should Always Verify the Intrafamilial Transmission

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## Abstract

**Background and Aims:** *Helicobacter pylori* infection is one of the most common gastrointestinal infections in humans; it affects about 30% of people in developed countries and about 80% in developing ones. The majority of patients acquire the infection during childhood and the intrafamilial transmission is considered one of the most important routes of infection.

The aim of this study was to assess the intrafamilial transmission rate among family members of index subjects.

**Methods:** We have suggested all patients *H. pylori*-positive (99 patients, symptomatic index subjects) diagnosed during 18 months (Sep 2011-Dec 2012) to screen their family members by stool antigen test (SAT) and, when positive, to perform upper gastrointestinal endoscopy.

**Results:** Through SAT we identified 126 patients belonging to 41 households of 99 initial index subjects, therefore 41 index subjects (41.4%) had at least one family member affected.

The entire population studied included 225 *H. pylori*-positive patients: 99 index subjects (symptomatic) and 126 family members diagnosed by SAT screening and histological examination by gastroscopy. Of these, 103 patients (81.7%) were considered slightly symptomatic (mild clinical history until then not important enough to perform further diagnostic study) and 23 patients (18.3%) were totally asymptomatic.

**Conclusions:** In the spread of *H. pylori* infection, the intrafamilial transmission is an important route of contamination; besides the known mother-to-child dyad, also the transmission among family members plays a considerable role and it should be always verified.

**Keywords:** *Helicobacter pylori* infection; Intrafamilial transmission; Clinical practice; Antigen fecal test

## Introduction

The prevalence of *Helicobacter pylori* (*H. pylori*) infection in European studies varies between 7 and 33%, while in developing countries can exceed 80% [1]. However the prevalence of the infection in these subgroups can be rather different, considering that the socio-economic level within sub-populations of the same country can change [2].

*H. pylori* infection is predominantly acquired in early childhood [3] and person-to-person contact within the family appears to be a key route for the transmission: oral-oral through vomiting or possibly saliva and dental plaque, faecal-oral, or gastrointestinal-oral [4]. However, the main source of the infection within family is not yet clear [5-7]. The more involved factor is the mother-child dyad: the oral secretions of the mother, which may be contaminated with *H. pylori*, can be transmitted to infant. Pre-masticating food before administering it to children is a popular maternal practice (mainly in developing country). Furthermore, the transmission may occur by the

common use of spoons, the licking of pacifiers or the nipples of feeding bottles or even by the chewing or tasting of children's food. Father tends to have less contact with his children than mother, so he is less involved in the transmission [8]. The relative risk of a child becoming infected with *H. pylori* has been reported to be approximately eight or four times greater if the mother or father is infected, respectively [9]. Because husbands and wives live together for a long period of time in a common environment and in close contact, *H. pylori* transmission is a highly probable event [3]. Also the infection status of siblings may be a major source of *H. pylori* infection among toddlers [9]. Moreover intrafamilial transmission could be also involved in the re-infection of *H. pylori* [10]; its presence among asymptomatic family members may facilitate the transmission within households [11].

Epidemiologic studies on *Helicobacter pylori* infection are various. Person to person transmission was precociously supposed and some papers started to analyze the infection rate among families. Some reviewed different aspects of the *H. pylori* occurrence and transmission with an emphasis on household factors [7]; later appeared the first strong evidences that a maternal-child transmission was an important route of infection, especially in populations with low *H. pylori* prevalence. Available studies tested the prevalence among

population and close communities (families) using different methods of determination also to understand which factors could make easier transmission. Anyway, it is important to underline that socio-economic level represent an independent risk factor for transmission of the infection, significant especially in developing countries. Although, once established within the gastric mucosa, the *H. pylori* persists throughout life [6,7], most infected subjects does not develop symptoms or peptic ulcer during their life and continue to live well presenting only a superficial chronic gastritis [4,12]. Nevertheless, these subjects are an important sources of infection and they may transmit it to healthy people some of which could become at risk of severe diseases.

However, there is a common consensus that the risk of acquisition and transmission of *H. pylori* can be largely reduced and prevented through a better control of intrafamilial spread [13].

### Aims

To draw the attention on this important mode of spreading in our area, we wanted to assess the intrafamilial transmission rate of *H. pylori* within families of infected subjects evaluated in the Gastroenterology Unit of a first-level hospital on the Emilian Apennines.

### Patients and Methods

Most epidemiological studies are based mainly on serological tests or urea breath test; other studies are based on more accurate, but difficult, busy and not always available molecular researches [14]. We wanted to assess the intrafamilial transmission rate of *H. pylori* by using two methods. We considered “infected” those patients who resulted positive to both SAT and to the subsequent histological examination after gastroscopy.

Between September 2011 to December 2012, we advised to all *H. pylori*-positive patients (99 patients: index subjects) identified by SAT and gastroscopy to test all their family members by using SAT, regardless of the presence of symptoms, previous oral informed consent. These index subjects (“symptomatic”) underwent gastroscopy with biopsies because of their symptoms severity (Table 1).

Symptoms	Histological characteristics	Mean age and sex
Dyspepsia/Epigastric Discomfort=74	Chronic Gastritis=74	52.7 yr (18-74 yr) M=57, F=42
Epigastric/Abdominal Pain=12	Gastric Atrophy/Intestinal Metaplasia=11	
Anemia=7	Erosive Gastritis=14	
Symptoms of GERD=6		

**Table 1:** Symptoms and histological features of index subjects (99 patients).

### Results

Out of these 99 symptomatic index subjects, 41 patients (41.4%) had family members affected by *H. pylori* infection. The overall family members were 131 who were then evaluated clinically and advised to perform endoscopy with biopsy in according to Sydney Criteria [15], to confirm the *H. pylori* infection and control their gastric mucosa's

health. Five of these patients were excluded from the study: three refused gastroscopy because of invasiveness and in the remaining two patients the *H. pylori* infection was not confirmed by the subsequent gastroscopy. Therefore 126 *H. pylori*-positive family members were enrolled belonged to 41 households of “symptomatic” index subjects. Twenty-three family members affected (18.3%) were asymptomatic with respect to *H. pylori* infection. Endoscopic features of these asymptomatic patients are shown in Table 2. The remaining 103 family members affected had symptoms for which a gastroenterologist evaluation was not considered necessary by themselves or their General Physician: we called them “slightly symptomatic” patients (their symptoms and endoscopic features are summarized in Table 3).

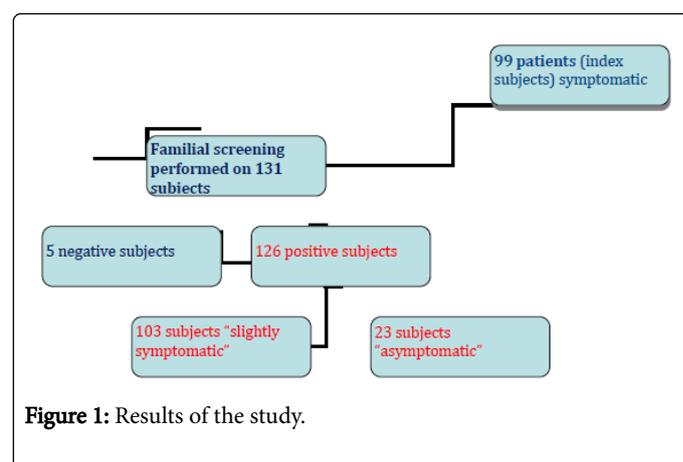
Mean age and sex	Histological characteristics
49.8 yr (18-68 yr) M=9, F=14	Erosive gastritis=8
	Active chronic gastritis=13
	Intestinal metaplasia/atrophic gastritis=2

**Table 2:** Features of the 23 asymptomatic patients.

Symptoms	Histological Characteristics	Mean Age and Sex
Bloating=9	Chronic Gastritis=83	49, 3 yr (18-70 yr) M=54, F=49
Occasional Dyspepsia/Epigastric Discomfort=88	Gastric Atrophy/Intestinal Metaplasia=9	
Mild Anemia=6	Erosive Gastritis=11	

**Table 3:** Symptoms and histological features of 103 slightly symptomatic patients.

So, we evaluated 225 *H. pylori*-positive patients. As regards the symptoms, we may divide our patients in 99/225 (44.0%) “symptomatic” and 126 patients diagnosed only by familial screening (103 “slightly symptomatic” (45.8%) and 23/225 (10.2%) asymptomatic) (Figure 1).



**Figure 1:** Results of the study.

Analyzing the single subjects, 4 families had no children infected (3 families consisting only of husband and wife and the fourth had one child *H. pylori*-negative). The remaining 37 families had *H. pylori*-positive children; in these families, the mother was infected in 34/37 (91.9%). Only in 3/37 families with *H. pylori*-positive children, the

mother was, at that time, *H. pylori*-negative (in fact, the families would be two, because in one case the mother was previously eradicated, some years earlier).

Among these 37 households, there were 22 extended families including grandparents: in 17/22 families, grandparents resulted affected and they were almost always maternal grandparents (14 out of 17). In these 14 families, the mother, her husband, one or more children and one or both maternal grandparents were affected. Grandparents lived in the same house, but in different apartments and often took care for grandchildren (i.e., eating together) (Table 4).

No. of families	Family Components	No. of people	Distribution of relatives within the family
4 families	Husband and wife	8 people	3 households without children and the last had only one child, not infected
22 families	Husband, wife and at least one son with or not grandparents	80 people	14 families with maternal grandparents affected
			3 families with paternal grandparents affected
			5 families with no grandparents affected (in all of these, the grandparents did not take care for children, habitually)
3 families	Father and son	6 people	In one case the mother has been eradicated prior the study
12 families	Mother with one or more children	32 people	6 families Mother+1 Child; 4 families Mother+2 Children; 2 family Mother+3 Children

**Table 4:** Distribution of family members (126 patients).

## Discussion

Intrafamilial transmission is a route of spreading of *H. pylori* infection on which, perhaps, we do not pay attention enough, but that certainly it may play a key role in the transmission of this infection. The close and intimate contact among family members appears to be a crucial way for the transmission of *H. pylori* infection [7,10,15-17].

Considering the substantial efforts that the *H. pylori* is forcing us every day, both to avoid complications that can be very serious (ex. peptic ulcer, gastric cancer) and the consequent heavy financial burden, it's time to take more accurate actions toward this infection and adopt a strategy to prevent it, also in Western countries [4].

This study confirms the important role of the mother in the transmission within the family; the mother was infected in 91.9% of families when the children were *H. pylori*-positive. Therefore considering the high infectiousness of *H. pylori* within the families, we may say that the family can be compared to a closed community, although we have no microbiological confirmation that these patients had the same bacterial strains. Compared to "symptomatics" (44.0% of overall patients), we risked losing 56% "slightly symptomatic" or asymptomatic patients and all of them were family members of index subjects; this confirms that the family is an important source of infection. Moreover, the asymptomatic patients were about 20% (18.2% exactly): an absolutely not negligible rate. We believe that we should

not overlook this percentage of patients whether we want really try to knock down the *H. pylori* transmission.

The concept of extended family, often with the presence of grandparents in the same household or otherwise having an active role in grandchildren education is still rooted in Italian culture particularly in smaller communities as on the Apennines. This further emphasizes the importance of the intrafamilial role in transmission of the *H. pylori* infection, also in developed countries where, however, sanitation within the household is considered careful.

However, we should remind that, the sample was not selected randomly, data cannot be considered as representative of the entire population for statistical reasons. Since we collected for the study 99 symptomatic patients with a positive fecal antigen test (SAT) and just subsequently we analyzed members of the same family, we maybe have left out of the study persons (not necessarily relatives) who lived in close contact with the family components (i.e., domestic workers, roommates) and our data may have been underestimated. Index cases were all symptomatic, so we think that the infection has spread within the families and infected subjects (identified by familial screening) were divided between "asymptomatic" or "slightly symptomatic". To eradicate or not to eradicate *H. pylori* infection in asymptomatic subjects is still today debated and unclear, but our purpose was observe the rate of infection, easily spread within the families. We have no reason to think that the study overestimates the percentage of infected cohabiting, nevertheless it's important to remind that geographical area of subjects is the same (although racial factor was not take into account).

In our study more than half of patients were "slightly symptomatic" or asymptomatic, so is the real prevalence of *H. pylori* infection underestimated? Do we really not diagnose about a 50% of the infected patients? Obviously, if we only consider just symptoms to diagnose *H. pylori*-infected patients, the infection rate is lower, as for celiac disease. Then, is there an iceberg also regarding the real *H. pylori* infection rate? However, on the other hand, must we really eradicate the "slightly symptomatic" or asymptomatic subjects?

Rightness of the eradication in asymptomatic subjects is still an open problem. "Treaters" support that early eradication of the infection reduce inflammation and progression to frank gastric malignancy. "Commensalists" consider *H. pylori* as a commensal and believe that eradication could worsen gastro-oesophageal reflux and even induce asthma. There is a controversy in decision to treat or not asymptomatic patients, but there are not doubts on the sequelae of infection: peptic ulcer disease, gastric cancer and MALT lymphoma. In contrast, there is disagreement as to effects of eradication on gastro-oesophageal reflux disease or Barrett's esophagus. Therefore, current preventive measurements recommend to treat infection and the possible gastro-oesophageal reflux.

You need to remember that 8.7% of these patients ("slightly symptomatic" and asymptomatic) had gastric atrophy or intestinal metaplasia, therefore they are at high risk to develop severe complications. Furthermore, we must ask ourselves whether eradicating *H. pylori* infection in "slightly symptomatic" or asymptomatic patients, would increase the risk of developing of other pathologies for which *H. pylori* infection seems to have an inverse relationship (ex. GERD or allergic diseases) [18].

Certainly we need further screening studies, mainly within the families of infected patients, to fully understand the real infection rate of *H. pylori*. Therefore, do we need of a mass screening? We think not,

because however, the health care costs would enormously increase; but, on the other side, when we diagnose a *H. pylori*-positive patient, we should always remember his family members because in our study the 41.4% of the index subjects had at least one family member affected who would have been lost or would have delayed the diagnosis.

*H. pylori* infection still being insidious, it is often overlooked in terms of prevention and we are concerned only when a patient is symptomatic [19]. We know that the main guidelines [20,21] recommended to test the first-degree relatives of patients with gastric cancer or patients with dyspepsia where the local prevalence of *H. pylori* infection is high, but perhaps we should better investigate the clinical history of relatives of all infected subjects so that we could also seize their minimum symptoms which are often underestimated. In this way, by reducing the undiagnosed patients, it could reduce the risk of reinfection within the family although rare [22] and limit the spread of *H. pylori* infection. Since the early age at acquisition of *H. pylori* infection may result in intense inflammation with early development of atrophic gastritis, subsequent risk of gastric ulcer and cancer or both, we likely need to implement health education programs within families (washing of hands and mouth, brushing teeth, no sharing of food plates or drinking glasses, no sharing of spoons in feeding children) to minimize the spread of infections, including that of *H. pylori* [19].

### Author Contributions

MM conceived and designed the study. He collected and analyzed the data together with SI and PG. MM wrote the manuscript together with FG and AG. BB and GLdeA critiqued and revised it. All authors approved the final version. MM collected data when was affiliated with Department of Medicine, Ospedale Sant'Anna, Azienda USL of Reggio Emilia, Castelnovo ne'Monti, Reggio Emilia, Italy.

### Conflict of Interest

All authors declared that they have no conflict of interests.

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