Prevalence of *Helicobacter pylori* Infection in Elderly Inpatients and in Institutionalized Old People: Correlation with Nutritional Status

M. C. NERI, L. LAI, P. BONETTI, A. R. BALDASSARRI, M. MONTI, P. DE LUCA, E. CUNIETTI, M. QUATRINI

**Summary**

*Helicobacter pylori* plays an important role in the aetiology and development of peptic ulcer disease. The prevalence of *H. pylori* infection increases with age, and is influenced by low socioeconomic status and poor hygiene owing to person-to-person transmission of the organism by the oral-faecal route. The aim of this study was to investigate the prevalence of *H. pylori* infection, detected serologically, in elderly patients admitted to a geriatric rehabilitation ward and in a sample of institutionalized old subjects. Nutritional status was also evaluated in order to examine its relation to *H. pylori* infection. The overall prevalence of *H. pylori* infection was 70.8%, the prevalence in hospitalized patients being 72.9% and in institutionalized subjects 68.7%.

No significant correlation was observed between anti-*H. pylori* IgG levels and either age or length of stay in the institution. We found no difference between *H. pylori* positive and negative patients as regards their self-sufficiency and cognitive functions. The prevalence of anti-*H. pylori* antibodies in the serum was not related to blood variables (including nutritional indices), history of drug consumption (in particular nonsteroidal anti-inflammatory drugs), dyspeptic symptoms, or alcohol and smoking habits.

**Introduction**

*Helicobacter pylori* is a Gram-negative, spiral-shaped bacterium with a strong affinity for gastric-type epithelium [1]. Since its identification and isolation by Marshall and Warren in 1983 [2], various epidemiological studies have demonstrated that this organism plays an aetiologial role in the development of type B active chronic gastritis [3] and is likely to be involved in the pathogenesis and recurrence of peptic ulcer [4–6]. Moreover, *H. pylori* is associated with duodenal ulcer in 70–100% of cases [7, 8] and with gastric ulcer in 50–90% [9, 10]. It is still not well established that *H. pylori* infection is related to non-ulcer dyspepsia [11, 12] and gastric neoplasia, in particular adenocarcinoma and lymphoma of the 'mucosa associated lymphoid tissue' (MALT lymphoma) [13–16].

*H. pylori* infection is distributed worldwide, but its prevalence changes considerably with age, ranging from less than 20% in adults aged under 20 years to more than 60% in the population aged over 60 in developed countries [17–20]. Subjects aged over 90 are reported to have a lower prevalence, probably owing to severe gastritis [21], but scanty information is available for this age group [22]. Earlier and more frequent *H. pylori* infection at younger ages is found in populations with low socio-economic status and poor hygiene [23–28].

This type of distribution of the infection and the recent report that *H. pylori* is found in the stool of infected subjects [29, 30] and in dental plaque [31, 32] suggest that person-to-person transmission between household or family contacts may occur [33–35].

The scanty information about a possible higher prevalence of *H. pylori* infection in custodial institutions (such as institutes for mental diseases or orphanages) and crowded communities [36–38] confirms that the organism spreads among subjects by the orofoecal route or from mouth to mouth via dental plaque [39, 40].

This study investigated the prevalence of *H. pylori* infection, detected serologically, in elderly subjects in short- or long-term care in geriatric rehabilitation institute in Milan.

**Patients and Methods**

From May to June 1994 we enrolled 96 patients (48 women, 48 men; mean age: 79.8 years, SD 9.4, range 60–100) in a geriatric institute in Milan, Northern Italy. Forty-eight of them (24 women and 24 men; mean age 79.6 years, SD 8.9, range 61–100) were admitted consecutively to a geriatric ward for rehabilitation after femoral or hip fractures, stroke, poliomyelitis, or senile Parkinson-like disease, and were studied at admission to the ward. They were age- and sex-matched with 48 subjects institutionalized for more than...
1 year (24 women and 24 men, mean age: 79.9 years, SD 10, range 60–100). Patients with cancer or terminal status were excluded.

Hygiene and living conditions conformed to the European Union uniform requirements for this kind of institutionalization and were checked periodically. At admission the patients or their relatives were asked about current use of drugs such as antibiotics, H₂-antagonists and omeprazole, and alcohol and/or smoking habits. Self-sufficiency was assessed on the activities of daily living (ADL) scale [41] and cognitive function by the Short Portable Mental Status Questionnaire (SPMSQ) [42]. Anthropometric measurements included body mass index (BMI), triceps skin-fold thickness (TSF), and arm muscle area (AMA) [43]. BMI is derived from the subject’s height (cm) and weight (kg) (kg/m²) and reflects general nutritional status. TSF is an indicator of fat reserves, and AMA [(mid-arm circumference TSF x 0.314)²/4 x 0.314] estimates skeletal protein status.

Specific serum antibodies to H. pylori (IgG) were detected by ELISA (fluorescent enzymatic immunoassay, Helori-Test IgG, Europharma R, cut-off < 30%, OD at 405 nm 0.809).

Blood samples were taken for iron (colorimetric method), transferrin (immunonephelometric method), total proteins and albumin (colorimetric method), prealbumin (nephelometric method), haemoglobin, glucose and BUN measurements. For statistical analysis of data, Student’s t test for unpaired data, simple regression analysis and χ² test were used as appropriate.

The study was approved by the local ethics committee and informed consent was obtained from patients or their relatives before entry to the study.

Results
The overall prevalence of H. pylori infection was 70.8%, the prevalence in hospitalized patients being 72.9% and in institutionalized patients 68.7% (Table I). H. pylori antibodies were found in 79.2% of the men (mean age 74 years, range 60–90) and 62.5% of the women (mean age 84 years, range 70–100) (Table I).

The patients were divided into four groups according to age (60–69; 70–79; 80–89; 90–100 years). Only men were present in the first age group (60–69 years), and only women in the last one (90–100 years). Table II shows the frequency of distribution of the H. pylori antibodies in the various age groups according to sex. The prevalence of H. pylori infection was similar in the two sexes only in the second group, with a higher prevalence in men in the third one. The prevalence of infection fell by about 25% in the last age group which consisted of women only. No significant correlation was observed between anti-H. pylori IgG levels and either age or length of stay in the institution.

The level of self-sufficiency (ADL score) and cognitive impairment (SPMSQ score) did not differ significantly in the hospitalized and institutionalized patients; the men had a better mean SPMSQ score than the women but a worse ADL score.

No differences were found between H. pylori positive and negative patients as regards level of self-sufficiency and cognitive functions.

According to the nutritional indices considered, the institutionalized patients were better nourished than the hospitalized ones (Table III). Serum total proteins, albumin and iron levels were significantly higher in institutionalized than hospitalized patients whereas haemoglobin was higher in the latter. No difference was found between men and women. Mean anthropometric indexes (BMI, TSF and AMA) were normal according to the reference range for elderly people proposed by Chulmea et al. [44] and did not differ between the two groups (Table IV). Both institutionalized and hospitalized men had lower mean TSF in comparison with the women.

No relation was found between H. pylori prevalence and blood variables, history of drug consumption

| Table II. Prevalence of Helicobacter pylori infection (%+) by age
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<tr>
<td>Age group</td>
<td>Men</td>
<td>Women</td>
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<tr>
<td></td>
<td>No.</td>
<td>%+</td>
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<tr>
<td>61–70</td>
<td>14</td>
<td>71</td>
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<tr>
<td>71–80</td>
<td>17</td>
<td>71</td>
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<tr>
<td>81–90</td>
<td>17</td>
<td>94</td>
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<tr>
<td>91–100</td>
<td>0</td>
<td>13</td>
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<tr>
<th>Table III. Biochemical variables [mean (SD)] in hospitalized and institutionalized elderly patients</th>
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<tr>
<td>Serum</td>
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<tr>
<td>Total protein (g/dl)</td>
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<tr>
<td>Albumin (g/dl)</td>
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<tr>
<td>Prealbumin (mg/dl)</td>
</tr>
<tr>
<td>Iron (μg/dl)</td>
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<tr>
<td>Transferrin (mg/dl)</td>
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<tr>
<td>Haemoglobin (g/dl)</td>
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<td>Glucose (mg/dl)</td>
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<td>BUN (mg/dl)</td>
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* p < 0.05, ** p < 0.01, *** p < 0.001 vs. hospitalized patients.
higher in men than in women, in line with another Italian study in which younger people were recruited [53]. The difference observed by us could be due to the fact that the men were usually more prone to socialize than the women. Moreover, the latter were older and showed higher levels of physical disability, as their lower ADL score demonstrated.

We did not observe any relation between prevalence of *H. pylori* infection and type of care. This could be due to the hygienic conditions which were comparable in the institutionalized patients and the others who had all been in hospital for less than 1 month. The absence of any relation between the prevalence of *H. pylori* infection and the length of institutionalization suggests that the standards of living of the institutionalized population were no different from those of the population still living at home. This observation does not support the notion of crowded communities as a major source of infection in older people, as reported in other studies in which, however, younger people were considered [36–38].

According to the literature *H. pylori* infection is not related to personal habits, such as smoking or alcohol intake, or administration of drugs, such as NSAIDs, or active treatments for dyspeptic symptoms. These symptoms are also probably underestimated because elderly people frequently underrate gastrointestinal symptoms, and cognitive impairment often makes it difficult to collect a medical history [54–56].

In our series, no correlations were found between *H. pylori* infection and nutritional indices, in particular, there was no relation between anti-*H. pylori* IgG titre and BMI, in contrast with a recent study showing such a correlation in younger subjects [56]. Possibly, BMI reflects social class-related aspects of current living conditions more accurately in younger than older subjects. Alternatively, BMI in elderly people may be more influenced by random variations, which would tend to reduce the magnitude of an effect [56]. It is commonly believed that institutionalization leads to malnutrition. However, patients arriving in our rehabilitation ward usually come from an acute-care hospital after short medical treatments and are often already weak, in poor health, and nutritionally depleted. Moreover, it has recently been underlined that institutionalization does not necessarily lead to malnutrition [57].

In conclusion, the prevalence of *H. pylori* infection in the elderly patients referred to our geriatric institute in Milan is similar to that reported in other older populations. The observed prevalence does not support the notion that crowded communities favour this infection. The oldest subjects are apparently more protected against the infection. Morbidity and mortality in old patients with *H. pylori* infection and peptic ulcer disease is aggravated by the tendency of elderly people to declare few symptoms, and peptic disease in this population is frequently revealed only when major complications such as bleeding or perforation develop, due in most cases to the uncontrolled use of NSAIDs.

### Discussion

The prevalence of *H. pylori* infection in our series (70.8%) is in accord with the few reports in the literature on groups of similar ages in developed countries; in fact, it is known that the presence of serum *H. pylori* antibodies is more frequent in older than younger subjects, with a progressive increase of *H. pylori* infection up to age 60 [17, 45, 46], then a plateau up to age 90 [20, 47, 48], and a fall thereafter [21, 22]. The peculiar plateau of *H. pylori* seropositivity could be explained by an age-cohort effect [49]. Old subjects could have a higher prevalence of infection because they have lived longer and hence have had more opportunity to become infected, or because they were born at a time when the risk of infection in childhood was higher than in those born later, owing to a decline of the infection rate with improved hygienic conditions. Better standards of living, water supply, sanitation, and housing in the last decades have decreased infection rates so that the incidence of new *H. pylori* infections in today's children and young persons has fallen. Seroconversion studies reveal a decline of 50% in the prevalence of *H. pylori* in the United States since 1986 [50], and a very low conversion rate in older people [5, 51].

Various explanations exist for the falling prevalence of *H. pylori* infection in the population over 90; the lower tendency to socialize of old people, owing to physical and psychosocial factors, with a reduced spread of infection; the progressive atrophy in the aged stomach, produces an unfavourable environment for *H. pylori* overgrowth; and the insufficient immunological response to an infective agent and/or the loss of immunocompetence of very old people. Finally, many people over 90 are edentulous, and the absence of dental plaque could explain the reduced spread of the infection [52].

In our study the prevalence of *H. pylori* infection was

<table>
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<tr>
<th>Anthropometric variables</th>
<th>Men n = 24</th>
<th>Women n = 24</th>
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<tr>
<td><strong>Hospitalized patients</strong></td>
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<tr>
<td>Body mass index</td>
<td>23.0 (4.0)</td>
<td>22.4 (3.9)</td>
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<tr>
<td>Triceps skin-fold thickness</td>
<td>1.04 (0.4)§</td>
<td>1.42 (0.4)</td>
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<tr>
<td>Arm muscle area</td>
<td>46.1 (16.2)</td>
<td>46.6 (13.4)</td>
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<tr>
<td><strong>Institutionalized patients</strong></td>
<td></td>
<td></td>
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<tr>
<td>Body mass index</td>
<td>22.8 (2.4)</td>
<td>22.0 (3.8)</td>
</tr>
<tr>
<td>Triceps skin-fold thickness</td>
<td>0.99 (0.3)§§</td>
<td>1.55 (0.5)</td>
</tr>
<tr>
<td>Arm muscle area</td>
<td>45.6 (1.26)</td>
<td>45.8 (13.8)</td>
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§p < 0.01, §§< 0.001 vs. women.

Table IV. Anthropometric variables [mean(SD)] in hospitalized and institutionalized patients.
These observations suggest that doctors should use more precautions in treating *H. pylori*-positive elderly patients, especially if NSAIDs are to be given. Moreover, eradication of *H. pylori* in old patients not only represents an important goal in the treatment of peptic disease, but it may also prevent transmission to younger family members or co-residents in geriatric institutions.

References