

# Review Articles

## Transmission of Helicobacter Pylori: A Mystery of Nature

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### Introduction

*Helicobacter pylori* is a small, highly motile, gram-negative bacillus. It is one of the commonest bacterial pathogens in human being<sup>1</sup>. There is a causal relationship of this small spiral organism to gastritis, peptic ulcer, lymphoproliferative disorder and gastric cancer<sup>2-5</sup>. *H. pylori* infects at least 50% of world's human population<sup>5</sup>. In developed countries, overall prevalence of infection in young children is under 10% but up to 50% of children living in poor socioeconomic conditions of developed nation is infected. On the other hand in developing countries up to 80% children under 10 years are infected<sup>6</sup>. Prevalence infection is higher in later age group both in developed<sup>7</sup> and in developing countries<sup>8,9</sup>. Infection is mainly acquired in childhood<sup>6</sup>. Poor socio-economic condition is regarded as main risk factor for developing infection. Many questions remained unanswered regarding this organism. Our present understanding remains cloudy and incomplete regarding transmission of this infecting agent. The review is written to orient health personnel specially clinicians regarding mode of transmission of such infection.

### Transmission of Helicobacter pylori

Despite the large volume of research on *Helicobacter pylori*, important epidemiological questions, such as how infection is transmitted, clearly remain unanswered. The fastidious nature of the organism, which makes culture difficult and the lack of accurate stereotyping system have hindered such studies<sup>6</sup>. The only consistent source of *Helicobacter pylori* is the gastric mucus of human being and some non-human primate. An environmental source of infection has not been identified. But person-to-person spread, seems to be the most likely mode of transmission. Evidence that supports person-to-person transmission is clustering of *Helicobacter pylori* infection in families and in institutions for the mentally handicapped. So, a common environmental source cannot be ruled out<sup>10</sup>.

A study of transmission pathways for *H. pylori* among a socioeconomically deprived Colombian community

with 90% prevalence of this infection in children did not implicate a single mode of transmission<sup>11</sup>. The study suggests that transmission of infection is from older to younger siblings. However, the possibility of parent-to-child transmission cannot be ignored because 61% of first-born children were infected, as were 63% children with no other siblings. The work pointed out that the risk factors for infection are difficult to detect<sup>11</sup>.

*H. pylori* is a microaerophilic organism that produces large amounts of urease, which enables it to survive in the acid environment of the stomach<sup>12</sup>. Possible routes of person-to-person transmission are faecal to oral, oral-to-oral or gastric to oral<sup>12</sup>. In animal studies *H. mustelae* has been detected in the faeces of infected ferrets when gastric pH was increased by administration of Omeprazole, but not when gastric acid secretion was normal<sup>13</sup>. Hypochlorhydria occurs in association with acute *H. pylori* infection in human beings, so perhaps young children shed the bacteria in faeces during the acute phase of infection. However, if faecal-to-oral transmission is common, then there should be outbreaks of infection associated with contamination of water supplies, but there is no evidence of such link<sup>6</sup>. *H. Pylori* has been cultured from water in limited number of studies<sup>3</sup>. Till that it is considered, *H. pylori* is transmitted mainly through faeco-oral route in developing countries and gastro-oral route in developed countries<sup>1,5</sup>. The complexity of the oral flora is a major drawback in attempts to isolate *H. pylori* from the oral cavity. The organism has been cultured from saliva and from dental plaque, but only occasionally. Evidence against oral-to-oral transmission is that the prevalence of infection is not increased among teenagers, and that, in couples, *H. pylori* does not seem to be spread by the oral route. Furthermore, although the prevalence of infection is higher than expected among gastroenterologists, it is not among dentists, which suggests that exposure to oral secretions is not a risk factor for infection<sup>6</sup>.

Gastric-to-oral transmission has been postulated in young children, among whom vomiting and gastroesophageal reflux is common. Recently *H. pylori* from vomitus of a 6 year old child were isolated<sup>14</sup>. The vomitus could act as a medium of transmission.

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Vector transmission also has been suggested, and it is biologically possible because the midgut of the housefly (*Musca domestica*) has a pH of 3.1 and may thus provide an ecological environment for *H. pylori*<sup>15</sup>.

Studies on reinfection after treatment for *H. pylori* are also informative in relation to transmission. Adults rarely become reinfected after successful treatment. Children aged over 5 years have a re-infection rate 2% per year, which is similar to that for adults<sup>16</sup>. This rate is low, especially because the children were exposed, after treatment, to high prevalence of infection in their families, with 65% of siblings and 75% of parents being infected. The question arises as to whether this low reinfection rate is due to immune protection or whether these children aged over 5 years and adults are no longer at risk of infection. Evidence of immune protection against *H. pylori* has not been reported. In fact, despite mounting a vigorous immune response to *H. pylori*, the host is unable to eliminate the infection.

The transmission of close-contact infection depends on the degree of mixing between susceptible and infected individuals, also on the degree of crowding and age- distribution among those susceptible to infection and those infected<sup>6</sup>. Improvement in sanitary habits with increasing age may be an explanation for low reinfection rates, but the change in degree of contact between family members as children grow up may also be important in reducing the exposure to infection. The low rate of reinfection in children aged over 5 years suggest that child-to-child transmission is an important route of transmission of *H. pylori* infection.

### Key Messages

- Helicobacter pylori infection is mainly acquired in childhood.
- How infection transmits till not clearly understood.
- Person-to-person transmission seems to be most likely mode of transmission.
- Transmission of infection from older to younger siblings is suggested.
- Parents to child transmission cannot be ignored.
- Faeco-oral route in developing countries and gastro-oral route in developed nations are mainly considered for transmission of infection.
- Poor socioeconomic condition and overcrowding are regarded as main risk factors for *H. pylori* infection.

### Conclusion

*Helicobacter pylori* is one of the most common bacterial infection in human being. Transmission of infection is not understood clearly. Person to person transmission seems to be most likely mode of transmission. Prospective studies are required for a full understanding of such epidemiology which might help to formulate a preventive measure of such common infection.

### References

1. Logan RPH, Walker MM. Epidemiology and diagnosis of Helicobacter pylori infection. *BMJ* 2001; 323: 920-22.
2. Bisset WM. Disorder of the alimentary tract and liver. In: Campbell AGM and Melantosh N, editors. *Forfar and Arneil's Textbook of Pediatrics*. 5th ed. Edinburgh UK: Churchill Livingstone; 1998. P. 431-32.
3. Poddar U, Thapa BR. Helicobacter pylori infection in children. *Indian Pediatr* 2000; 37: 275-83.
4. Herbst JJ. Ulcer disease. In: Behrman RE, Kliegman RM, Jenson HB, editors. *Nelson Textbook of Pediatrics*. 16th ed. Singapore: Hart court Asian private Ltd.; 2000. P. 1147-48.
5. Das JC, Nazir MFH. Helicobacter pylori infection in Children: Diagnosis and Treatment-A Review. *Bangladesh J Child Health* 2006; 29: 22-30.
6. Rowland M. Transmission of Helicobacter pylori: is it all child's play? *Lancet* 2000; 355: 332-33.
7. Granstrom M, Tindberg Y, Blennow M. Seropidemiology of Helicobacter pylori infection in children monitored from 6 months to 11 years of age. *J Clin Microbiol* 1997; 35: 468-70.
8. Lindkvist P, Asrat D, Nilsson I. Age at acquisition of Helicobacter pylori infection: comparison of a high and low prevalence country: *Scand J Infect Dis* 1996; 28:181-84.
9. Mitchell HM, LiYY, Hu PJ. Epidemiology of Helicobacter pylori in southern China: Identification of early childhood as the critical period for acquisition. *J Infect Dis* 1992; 166:149-53.
10. Drumm B, Perez-Perez GI, Blaser MJ, Sherman PM. Intrafamilial clustering of Helicobacter pylori infection. *N Engl J Med* 1990; 322: 359-63.

11. Goodman KJ, Correa P, Tengana Aux HJ. Helicobacter pylori infection in the Colombian Andes: a population-based study of transmission pathways. *Am J Epidemiol* 1996; 144: 290-99.
12. Clyne M, Labigne A, Drumm B. Helicobacter pylori require an acidic environment to survive in the presence of urea. *Infect Immun* 1995; 63: 1669-73.
13. Fox JG, Blanco MC, Yan L. Role of gastric pH in isolation of helicobacter mustelae from the faeces of ferrets. *Gastroenterology* 1993; 104: 86-92.
14. Leung WK, Siu KKK, Kwok CLK, Chan SY, Sung R, Sung JJY. Isolation of Helicobacter pylori from vomitus in children and its implications in gastro-oral transmissio. *Am J Gastroenterol* 1993; 94: 2881-84.
15. Grubel P, Hoffman JS, Chong FK, Burstein NA, Mepani C, Cave DR. Vector potential of houseflies (*Musca domestica*) for Helicobacter pylori. *J Clin Microbiol* 1997; 35: 1300-03.
16. Rowland M, Kumer D, Daly LO, Connor P, Vaughan D, Drumm B. Low rates of Helocobacter pylori reinfection in children. *Gastroenterology* 1999; 117: 336-41.