

# Prevalence of *Helicobacter pylori* in a First Nations population in northwestern Ontario

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## Abstract

**Objective** To assess prevalence of *Helicobacter pylori* infection, reasons for referral for gastroscopy, and clinical findings of gastroscopy in a symptomatic First Nations population in northwestern Ontario from 2009 to 2011.

**Design** Three hundred four hospital charts of symptomatic patients who underwent upper endoscopy between June 2009 and March 2011 were reviewed.

**Setting** Meno Ya Win Health Centre in Sioux Lookout, Ont.

**Participants** First Nations patients with dyspepsia undergoing gastroscopy.

**Main outcome measures** Reason for referral, and clinical and histologic findings on gastroscopy.

**Results** The most common reasons for referral for gastroscopy were dyspepsia (59.2%) and undiagnosed anemia (18.1%). Overall, 66.8% of patients underwent biopsies; 37.9% of these patients tested positive for *H pylori*. Gastritis was encountered the most often, in 46.1% of patients; gastric ulcers in 6.9% of patients; and normal gastric mucosa was seen 36.8% of the time. The rate of *H pylori* infection is higher than in urban Canadian populations, but lower than in previous aboriginal prevalence estimates, particularly those based on seroprevalence values.

**Conclusion** This study raises the clinical question of how eradication testing and treatment protocols should be addressed in remote regions with high disease prevalence. As more is learned about the role *H pylori* infection plays in serious gastrointestinal diseases, rural and aboriginal populations might need a special focus on testing availability and treatment close to home.

## EDITOR'S KEY POINTS

- In this study, the *Helicobacter pylori* histologic prevalence among 203 patients who underwent biopsies during upper endoscopies was 37.9%. This figure is slightly higher than previous estimates of 23% to 32% from studies in Canada's urban centres, and lower than previous estimates of 50% to 95% from studies in aboriginal communities across Canada.
- Variables that might confound direct comparison of prevalence figures include the designated tests used to estimate prevalence, symptomatic versus cross-sectional volunteer patients, and use of suppressive medications.
- Additional research, including social determinants of health (sanitation and housing), might clarify the evolving prevalence of *H pylori* among First Nations populations in northern Canada. This study raises the clinical question of how eradication testing and treatment protocols should be addressed in remote regions.

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# Prévalence de l'*Helicobacter pylori* dans une population des Premières Nations du nord-ouest de l'Ontario

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## Résumé

**Objectif** Déterminer la prévalence de l'infection à *Helicobacter pylori*, les raisons pour demander une gastroscopie et les trouvailles cliniques de la gastroscopie dans une population symptomatique des Premières Nations du nord-ouest de l'Ontario entre 2009 et 2011.

**Type d'étude** Revue de 304 dossiers hospitaliers de patients symptomatiques ayant subi une endoscopie supérieure entre juin 2009 et mars 2011.

**Contexte** Le centre de santé Meno Ya Win à Sioux Lookout, Ontario.

**Participants** Patients des Premières Nations subissant une gastroscopie pour dyspepsie.

**Principaux paramètres à l'étude** Raisons pour demander une gastroscopie, et constatations cliniques et histologiques à la gastroscopie.

**Résultats** Les raisons les plus fréquentes de demander une gastroscopie étaient une dyspepsie (59,2%) et une anémie de cause inconnue (18,1%). Dans l'ensemble, 66,8% des patients ont eu une biopsie; 37,9% de ces derniers présentaient un test positif à l'*H. pylori*. La gastrite était la constatation la plus fréquente (46,1% des patients), suivie de l'ulcère d'estomac (6,9% des patients), tandis que 36,8% des patients avaient une muqueuse gastrique normale. Le taux de l'infection à *Helicobacter pylori* est plus haut que dans les populations urbaines canadiennes mais plus bas que les valeurs antérieurement estimées pour les Autochtones, notamment celles fondées sur la séroprévalence.

**Conclusion** À partir des résultats de cette étude, on peut se demander comment, en clinique, on doit aborder les tests d'éradication et les protocoles de traitement dans les régions éloignées où la prévalence de cette maladie est élevée. Avec une meilleure connaissance du rôle que joue l'infection à *Helicobacter pylori* dans certaines maladies gastro-intestinales sévères, on devrait apporter une attention particulière à la disponibilité géographique des tests et des traitements pour les populations rurales et autochtones.

## POINTS DE REPÈRE DU RÉDACTEUR

- Dans cette étude, la prévalence histologique de l'*Helicobacter pylori* chez 203 patients qui avaient eu une biopsie lors d'une endoscopie supérieure était de 37,9%. Ce chiffre est légèrement supérieur aux estimations obtenues antérieurement dans des études sur des centres urbains canadiens et inférieur aux estimations antérieures de 50 à 95% provenant d'études sur diverses communautés autochtones du Canada.
- Parmi les variables susceptibles de biaiser une comparaison directe des chiffres de prévalence, mentionnons les tests choisis pour estimer la prévalence, l'utilisation de patients symptomatiques plutôt que de volontaires transversaux et l'utilisation de médicaments suppressives.
- Des études additionnelles, incluant des déterminants de la santé (conditions sanitaires et logement), permettraient de clarifier les changements de la prévalence de l'infection à *Helicobacter pylori* dans les populations des Premières Nations du nord du Canada. Cette étude soulève une question d'ordre clinique sur la façon de concevoir les tests d'éradication et les protocoles de traitement dans les régions éloignées.

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Little is known about the prevalence of upper gastrointestinal (GI) diseases among aboriginal Canadians. Previous community-based studies have demonstrated that the rates of peptic ulcer disease, gastric cancer, and seropositivity for *Helicobacter pylori* are all elevated among aboriginal groups across Canada.

*Helicobacter pylori*, a Gram-negative bacterium that colonizes human gastric mucosa, was first described in 1984 for its role in chronic antral gastritis and peptic ulcer disease.<sup>1</sup> It has subsequently been shown to be associated with serious diseases including gastric cancer and gastric mucosa-associated lymphoid tissue lymphoma.<sup>2</sup> Globally, it remains one of the most common infections, as an estimated 50% of the world's population are carriers of the bacterium.<sup>3</sup>

While the prevalence of *H pylori* infection has declined in many parts of North America and western Europe, no such decline has been noted in the developing world. In countries such as Nigeria and Bangladesh, the prevalence of *H pylori* infection reaches 50% by the age of 5, and exceeds 90% in adulthood.<sup>4</sup> The prevalence in Canada is considerably lower. A 2007 urban Ontario study found a seroprevalence as low as 23.1% among 1306 adults aged 50 to 80.<sup>5</sup> Other cross-Canada statistics identified prevalence rates of 30% to 38%.<sup>3,6-8</sup>

The relatively low *H pylori* prevalence in developed countries is related to improved standards of living. Although an exact source of *H pylori* infection has not yet been found, studies from Latin America have shown that contaminated water might act as a reservoir for the bacterium.<sup>4</sup> It is therefore not surprising that the development of modern water-purification systems might be associated with decreased *H pylori* prevalence. The mode of transmission for *H pylori* is also not definitively known; however, epidemiologic studies strongly support person-to-person transmission, with fecal-oral or oral-oral routes being the most likely.<sup>9</sup> Therefore, the other important risk factors for transmission include overcrowding and lack of modern sanitation infrastructure.<sup>3,4,9</sup>

### Prevalence in aboriginal populations

Despite a relatively low *H pylori* prevalence in Canada, in 2006, the Canadian Helicobacter Study Group identified 3 groups of Canadians who were still at higher risk of *H pylori* infection: elderly people, immigrants, and aboriginal populations.<sup>3,10</sup> Data on *H pylori* prevalence in Canadian aboriginal populations are sparse. A 2008 review by Goodman et al identified only 4 studies documenting *H pylori* prevalence among Canadian aboriginal populations: 3 studies in Inuit communities and 1 study in a First Nations community.<sup>3</sup> A study of the Wasagamack First Nation in northern Manitoba found 95% of residents were seropositive for *H pylori* in 1999. The incidence of hospitalizations associated with

peptic ulcer disease was twice that of nonaboriginal populations (394.3 per 100 000 vs 203.8 per 100 000).<sup>11</sup> Follow-up studies in the Wasagamack First Nation in 2002 and 2004 found the prevalence of *H pylori* among children aged 6 weeks to 12 years to be 56%, and the incidence to be increasing 16% annually.<sup>12,13</sup>

Studies from Inuit communities across the Canadian arctic region have also found high prevalence of *H pylori*. A 1999 study in the communities of Chesterfield Inlet and Repulse Bay found a seroprevalence of 50.8%.<sup>14</sup> The Canadian North *Helicobacter pylori* Working Group, investigating a high prevalence of gastric cancer in the community of Aklavik in the Northwest Territories, found a prevalence rate of 55% in 2006 based on urea breath testing (UBT) results.<sup>15</sup> A follow-up study in the same community found an *H pylori* prevalence rate of 67% on gastric biopsy in a subset of individuals undergoing endoscopy.<sup>16</sup>

Testing for *H pylori* can be performed through both invasive and noninvasive techniques. Common noninvasive techniques include serology, UBT, and stool antigen testing. Invasive techniques include upper endoscopy with gastric biopsy. Serology-based evaluation of *H pylori* status is limited by a 30% false-positive rate, as immunoglobulin G testing reveals both previous (treated) and present infections.<sup>17</sup> For example, a 2011 study in Alaska found a 50% prevalence on biopsy in a population previously noted to have a 75% seropositive rate of *H pylori*.<sup>18</sup> To avoid detection of previous (treated) *H pylori* infections, UBT and stool antigen testing are useful. The latter test has yet to be validated in community-based settings; UBT is available in many urban hospital laboratories but not in rural communities across northern Ontario. It is also not currently performed by the Public Health Ontario Laboratories.<sup>19</sup> The criterion standard test for the detection of *H pylori* remains histology from gastric biopsy.

### Aim

The aim of our study was to determine the prevalence of *H pylori* infection among patients who underwent gastroscopies at the Meno Ya Win Health Centre in Sioux Lookout, Ont, from 2009 to 2011. This centre is the primary referral centre for the 29 First Nations communities north of Sioux Lookout, and has a catchment population that is 83% First Nations.<sup>20</sup> Secondary aims of this study were to review common reasons for upper endoscopy referral, the frequency of "alarm features," and endoscopic findings.

## METHODS

We reviewed 304 hospital charts of patients who underwent upper endoscopy in Sioux Lookout between June 2009 and March 2011. This included a review of

referral letters, anesthetic records, nursing records, and operative notes. Charts were assessed for basic demographic information, medications, reasons for initial referral, alarm features at the time of referral, endoscopic findings, and *H pylori* status. In patients with suspected GI pathology on endoscopy, *H pylori* status was determined based on histologic analysis of multiple gastric, antral, and body biopsies. A diagnosis of *H pylori* infection was confirmed when any single biopsy tested positive for the bacterium. All gastric biopsies were assessed at a single referral laboratory with 2 senior pathology staff reporting the material. The laboratory participates in internal quality control and review to ensure consistency of reporting practices between the 2 pathologists.

Alarm features included age older than 50 years, active GI bleeding, anemia, melena, vomiting, unexplained weight loss, dysphagia, family history of colon cancer, and abdominal mass. These were identified from referral notes and histories, and are thought to be associated with clinically important GI pathologies such as malignancy, ulcer, or stricture.<sup>21,22</sup> Current guidelines suggest prompt endoscopy for all patients older than 50 presenting with new-onset dyspepsia, or younger patients presenting with alarm features.<sup>21</sup> The value of alarm features in predicting malignancy, however, remains unclear.<sup>22</sup>

Data were compiled in an Excel file and imported into SPSS, version 20.0, for statistical analysis. Data were analyzed descriptively, including means and standard deviations for continuous data, and frequencies and percentages for categorical data. Chi-square ( $\chi^2$ ) testing (Pearson correlation or Fisher exact tests as appropriate) was used to examine the association between endoscopy findings and presence of *H pylori* on biopsy.

Ethics approval for this study was obtained from the Sioux Lookout Meno Ya Win Health Centre Research Review Committee.

## RESULTS

### Demographic and clinical characteristics

Among the 304 upper endoscopies reviewed, 170 (55.9%) were performed on women and 134 (44.1%) were performed on men; patients had a mean (SD) age of 52.7 (15.9) years. **Table 1** provides the demographic and clinical information for the 304 patients. Alcohol and tobacco consumption were common, with 36.8% being current alcohol consumers, and 36.8% being current smokers. The most common comorbidities included hypertension (57.6%) and type 2 diabetes mellitus (40.5%). The percentage of patients taking gastric-acid suppression medication was also high, as 44.7% were taking proton pump inhibitors (PPIs) and 10.2% reported taking histamine-2 receptor antagonists.

**Table 1. Demographic characteristics of 304 patients who underwent upper endoscopy: Percentages might not add to 100% because of missing data or patients having multiple entries.**

CHARACTERISTIC	VALUE
Age, y	
• Mean (SD)	52.7 (15.9)
• Range	3-92
Weight, kg	
• Mean (SD)	82.1 (18.9)
• Range	42-162
Men, n (%)	134 (44.1)
Cigarette consumption, n (%)	
• Never	123 (40.5)
• Current smoker	112 (36.8)
• Past smoker	57 (18.8)
Alcohol consumption, n (%)	
• Never	131 (43.1)
• Current drinker	112 (36.8)
• Past drinker	22 (7.2)
Comorbidities, n (%)	
• Hypertension	175 (57.6)
• Type 2 diabetes mellitus	123 (40.5)
• Hypercholesterolemia	79 (26.0)
• History of coronary artery disease	37 (12.2)
Medications, n (%)	
• PPIs	136 (44.7)
• NSAIDs (including acetylsalicylic acid)	107 (35.2)
• Histamine-2 receptor antagonists	31 (10.2)
• Warfarin	7 (2.3)

NSAID—nonsteroidal anti-inflammatory drug, PPI—proton pump inhibitor.

### Reasons for referral and alarm features

**Table 2** provides the reasons for referral and the prevalence of alarm features. The most common reason for referral was a complaint of dyspepsia (59.2%), followed by not-yet-diagnosed anemia (18.1%) and a positive fecal occult blood test result (6.3%). Isolated complaints such as recent rectal bleeding, upper GI bleeding, or melena stool were less common. The most common alarm feature present at the time of referral was age older than 50 years (58.9%). Other common alarm features included active upper or lower GI bleeding (33.6%), anemia (28.3%), and melena (17.1%).

### Endoscopic findings and *H pylori* prevalence

**Table 3** provides the endoscopic findings and the prevalence of *H pylori* in the subgroup of 203 patients who underwent biopsies. Gastritis was the most common endoscopic finding, present in 140 patients (46.1%). The second most common finding was normal upper endoscopy results (36.8%). Esophagitis, gastric ulcer, and



**Table 2. Reasons for referral and alarm features reported at time of referral: N=304; percentages might not add to 100% because of missing data or patients having multiple entries.**

VARIABLE	N (%)
Reason for referral	
• Dyspepsia	180 (59.2)
• Anemia not yet diagnosed	55 (18.1)
• Positive fecal occult blood test result	19 (6.3)
• History of rectal bleeding	18 (5.9)
• History of change in bowel habits	12 (3.9)
• History of upper GI bleeding	8 (2.6)
• History of melena	5 (1.6)
• Other	7 (2.3)
Alarm features	
• No alarm feature	47 (15.5)
• Age > 50 y	179 (58.9)
• Active GI bleeding	102 (33.6)
• Anemia	86 (28.3)
• Melena	52 (17.1)
• Vomiting	47 (15.5)
• Unexplained weight loss	34 (11.2)
• Dysphagia	25 (8.2)
• Family history of colon cancer	16 (5.3)
• Abdominal mass	2 (0.7)
GI—gastrointestinal.	

**Table 3. Frequency of endoscopic findings and *Helicobacter pylori* prevalence: N=304; percentages do not add to 100% because some patients had multiple findings.**

FINDINGS	N (%)
Normal upper endoscopy	112 (36.8)
Gastritis	140 (46.1)
Esophagitis	21 (6.9)
Gastric ulcer	21 (6.9)
Duodenitis	21 (6.9)
Duodenal ulcer	10 (3.3)
Malignancy	2 (0.7)
Other	43 (14.1)
Gastric or duodenal biopsy	203 (66.8)
<i>H pylori</i> -positive biopsy*	77 (37.9)

\*Biopsies were conducted for 203 patients.

duodenitis were all equally common (6.9%). Duodenal ulcers and malignancy were less common, present in only 10 (3.3%) and 2 (0.7%) patients, respectively.

Biopsies were obtained in 203 (66.8%) endoscopies when deemed clinically necessary at the time of the procedure. The overall *H pylori* prevalence, based on histology, was 37.9%. No specific endoscopic finding was significantly associated with *H pylori* status. On

$\chi^2$  testing, the significance levels ranged from  $P = .45$  (gastritis) to  $P = .84$  (esophagitis).

## DISCUSSION

### Prevalence of *H pylori*

In this study, the histologic prevalence of *H pylori* among 203 patients who underwent biopsies during upper endoscopies was 37.9%. This figure is slightly higher than previous estimates of 23% to 32% from studies in Canada's urban centres.<sup>5,8,23</sup> Conversely, the prevalence is lower when compared with previous estimates of 50% to 95% from studies in aboriginal communities across Canada.<sup>11,12,14-16</sup>

However, it is difficult to make direct comparisons among the findings from these studies. Each study used different methods for detecting *H pylori*. Apart from this study, only 2 previous Canadian studies have documented *H pylori* prevalence based on histology. One urban study by Thomson et al, focusing on patients with uninvestigated dyspepsia referred for gastroscopy, found a prevalence of 30% based on histology.<sup>8</sup> Another study by Cheung et al, focusing on the Inuit community of Aklavik, found an *H pylori*-positive biopsy rate of 67% among asymptomatic volunteer patients.<sup>16</sup> In the Aklavik study, all gastroscopy patients underwent biopsies. Our study involved biopsies done for clinical reasons.

In the study by Thomson et al, patients were not permitted to use PPIs within 30 days of their enrolment in the study.<sup>8</sup> In our study, 44.7% of patients were taking PPIs at the time of their upper endoscopies. This might have had a considerable effect on the sensitivity of histology in detecting *H pylori*. The use of PPIs is associated with decreased density of *H pylori* in the gastric antrum, as well as migration of the bacterium into deeper tissue.<sup>24</sup> Together, this might cause a 10% rate of false-negative biopsies, underestimating *H pylori* prevalence.<sup>25</sup>

Additional variables that might confound direct comparison of prevalence figures include levels of household overcrowding, quality of water and sanitation, and previous use of *H pylori* eradication therapies. Although not consistently recorded in hospital records, approximately 10% of patients in this study reported at the time of endoscopy referral that they had previously taken *H pylori* triple therapy. This too would have decreased *H pylori* prevalence among gastric biopsies taken at the time of endoscopy.

### Endoscopic findings

The frequency of endoscopic findings is relatively high in this study population. In particular, the rate of gastric ulcer (6.9%) is more than double the rate found in other studies. In the urban study by Thomson et al in 2003, only 3% of patients undergoing endoscopy were found

to have gastric ulcers.<sup>8</sup> Similarly, in the Aklavik study, 3.1% of patients were found to have gastric ulcers.<sup>16</sup> Additionally, the rate of gastritis in our study population (46.1%) is more than 3 times higher than the rate found in the Inuit study (13.9%).<sup>16</sup> The rates of duodenitis (6.9%), duodenal ulcer (3.3%), and malignancy (0.7%) are comparable with the rates found in both the urban and Inuit studies.

## Comorbidities

The prevalence of current cigarette smoking (36.8%) among the endoscopy patients was higher than the average for patients of the Thunder Bay District Health Unit (26.6%).<sup>26</sup> The alcohol use estimated from our retrospective chart analysis was noteworthy at 36.8%, but far lower than the 57% found by Thomson et al in their 2003 urban Canadian study.<sup>8</sup> Current alcohol use did not appear to explain the greater prevalence of gastritis or gastric ulcers, as current alcohol consumers in our study had the lowest rate of gastritis (33.9%,  $P=.02$ ). The prevalence of comorbidities was also high, with 57.6% of patients having hypertension, and 40.5% having type 2 diabetes mellitus. The prevalence of diabetes among the endoscopy patients in this study is more than 8 times higher than the national prevalence of 4.9%.<sup>26</sup>

## Limitations


As a retrospective cohort study, data collection was limited to the information available in hospital records. The records did not include information on risk factors for *H pylori* infection (eg, number of household members, type of sanitation facility used, source of water, level of education). Information on previous *H pylori* testing and eradication was also not always available. A retrospective study is also not adequate for the evaluation of rare outcomes, such as gastric cancer.

## Conclusion

The Canadian *Helicobacter* Study Group has identified aboriginal populations as being at higher risk of *H pylori* infection and its associated diseases. The *H pylori* prevalence, based on histology among 203 patients undergoing upper endoscopy at the Meno Ya Win Health Centre was 37.9%. This figure is higher than estimates from studies in Canadian urban centres.

However, the prevalence is lower than in previous studies in aboriginal communities in northern Manitoba and the Canadian arctic region. This might be owing to variations in study design, the designated tests used to estimate prevalence, symptomatic versus cross-sectional volunteer patients, or use of suppressive medications.

Additional research, including social determinants of health (sanitation and housing), might tell us more about the evolving prevalence of *H pylori* among First Nations populations in northern Canada. Our study raises the

clinical question of how eradication testing and treatment protocols should be addressed in remote regions. 

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### Contributors

All authors contributed to the concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

### Competing interests

None declared.

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