

Helicobacter pylori status among patients undergoing gastroscopy in rural northern Alberta

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Abstract

Objective To determine the *Helicobacter pylori* status of patients who underwent gastroscopy.

Design Retrospective chart review.

Setting Peace River Community Health Centre in rural northwestern Alberta.

Participants Data were collected from patients who had a gastroscopy performed by either of 2 family physicians between January 1, 2011, and December 31, 2012.

Main outcome measures The proportion of patients who had positive test results for *H pylori* overall and among first-time gastroscopy patients. For first-time gastroscopy patients, the associations between *H pylori* infection and patient age, sex, residence, and procedural indications and findings were explored.

Results A total of 251 gastroscopies were conducted in 229 unique patients during the study period. Overall, 12.4% (95% CI 8.3% to 16.4%) of patients had positive results for *H pylori* and among the 159 first-time gastroscopy patients, 17.6% (95% CI 11.7% to 23.5%) had positive test results for *H pylori*. *Helicobacter pylori* status did not differ significantly by geography, sex, or age. The prevalence of *H pylori* was higher among patients with *H pylori*-related indications for gastroscopy (such as dyspepsia and upper gastrointestinal tract bleeding) than among patients with other indications; however, *H pylori* infection was not statistically significantly greater in patients diagnosed with peptic ulcer disease.

EDITOR'S KEY POINTS

- It was found that 12.4% of patients who underwent gastroscopy in the rural Peace River region of northern Alberta had positive results for *Helicobacter pylori*, approximately half of the reported national average. Positive results for *H pylori* were higher among individuals with a first-time gastroscopy (17.6%) and among individuals with *H pylori*-associated indications for gastroscopy, notably dyspepsia.

- Given the moderate use of nonsteroidal anti-inflammatory drugs in this population undergoing gastroscopy, patients in the Peace River region are likely to benefit from cessation of nonsteroidal anti-inflammatory drugs and initiation of empiric proton pump inhibitor therapy as a first step, before further *H pylori* testing is done. Selectively performing *H pylori* biopsies in patients with *H pylori*-associated endoscopic indications or findings could be considered with minimal adverse implications for patients and potential cost savings.

- Population-based research is required to better ascertain temporal and regional differences in *H pylori* prevalence.

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Conclusion The prevalence of *H pylori* infection among patients undergoing gastroscopy in rural northern Alberta appears lower than other Canadian estimates. In regions with low *H pylori* rates, patients with dyspepsia might be better served by acid suppression and nonsteroidal anti-inflammatory drug cessation before investigating for *H pylori* infection. Population-based research is required to further describe regional differences in *H pylori* rates.

Prévalence d'*Helicobacter pylori* chez les patients d'une région rurale du nord de l'Alberta qui subissent une gastroscopie

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Résumé

Objectif Déterminer la prévalence d'*Helicobacter pylori* chez des patients qui subissent une gastroscopie.

Type d'étude Revue rétrospective de dossiers.

Contexte Le centre de santé de la communauté de *Peace River* du nord-ouest de l'Alberta.

Participants On a recueilli les données provenant des patients chez qui des gastroscopies ont été effectuées par l'un ou l'autre de deux médecins de famille entre le premier janvier 2011 et le 31 décembre 2012.

Principaux paramètres à l'étude La proportion de résultats positifs pour l'*H pylori* chez l'ensemble des patients et celle chez ceux qui en étaient à leur première gastroscopie. Chez les patients à leur première gastroscopie, on a recherché la présence d'associations entre une infection à *H pylori* et l'âge, le sexe et la résidence du patient, et entre les indications de la biopsie et ses résultats.

Résultats Un total de 251 gastroscopies ont été effectuées chez 229 patients différents au cours de l'étude. Le pourcentage de résultats positifs pour l'*H pylori* était de 12,4% pour l'ensemble des patients (IC à 95% 8,3% à 16,4%) et de 17,6% (IC à 95% 11,7% à 23,5%) pour les 159 qui avaient eu une première biopsie. La prévalence d'*Helicobacter pylori* ne différait pas de façon significative selon le lieu de résidence, le sexe ou l'âge. Cette prévalence était plus élevée chez les patients avec des indications de gastroscopie (comme une dyspepsie ou un saignement du tractus gastro-intestinal proximal) et chez ceux qui avaient d'autres indications; toutefois, le taux d'infection par *H pylori* n'était pas significativement plus élevé chez les patients qui avaient un diagnostic d'ulcère peptique.

Conclusion Chez les patients des régions rurales du nord de l'Alberta, la prévalence des infections par *H pylori* semble inférieure à celle rapportée pour l'ensemble du Canada. Avant d'envisager une gastroscopie chez les patients des régions où le taux d'*H pylori* est bas, il y aurait avantage à traiter la dyspepsie en introduisant un inhibiteur de la pompe à proton et en cessant les anti-inflammatoires non stéroïdiens. D'autres études seront nécessaires pour mieux évaluer les différences régionales dans les taux d'*H pylori*.

POINTS DE REPÈRE DU RÉDACTEUR

- On a observé que 12,4% des patients de la région rurale de *Peace River* du nord de l'Alberta avaient des résultats positifs pour l'*Helicobacter pylori*, soit environ la moitié du taux moyen rapporté pour l'ensemble du Canada. Le nombre de résultats positifs était plus élevé chez ceux qui en étaient à leur première gastroscopie (17,6%) et chez ceux où il était indiqué d'en faire une, notamment en raison d'une dyspepsie.

- Étant donné que les patients de la région de *Peace River* qui subissent une gastroscopie font un usage modéré d'anti-inflammatoires non stéroïdiens, ils auraient vraisemblablement avantage à cesser cette médication pour commencer une thérapie empirique à base d'inhibiteurs de la pompe à protons comme première étape avant toute nouvelle recherche d'*H pylori*. On devrait envisager d'être plus sélectif lors de la recherche d'*Helicobacter pylori* chez les patients pour lesquels il y a indication d'endoscopie, et ce, avec un minimum de conséquences fâcheuses pour les patients et possiblement à un meilleur coût.

- Il faudra d'autres études de population pour mieux évaluer les différences régionales dans la prévalence d'*H pylori*.

Cet article a fait l'objet d'une révision par des pairs.
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Helicobacter pylori is a Gram-negative gut bacterium associated with dyspepsia, peptic ulcer disease (PUD), and gastric cancer.¹ Transmitted by the fecal-oral route in childhood, around 50% of the world's population is infected with *H pylori*,² with rates being higher in developing countries with lower socioeconomic status.^{3,4} It is estimated that about 25% of the general Canadian population is infected with *H pylori*,^{5,6} with higher infection rates among the Inuit, some First Nations communities, and immigrants from *H pylori*-endemic countries.⁷ Population-based research suggests *H pylori* infection rates in some regions are declining over time^{8,9}; however, the current prevalence of *H pylori* in rural northern Alberta is unknown. Dyspepsia is a common reason for patients to visit health care providers¹⁰ and for having gastroscopy performed in rural northern Alberta.¹¹ Having knowledge about regional *H pylori* rates would help determine appropriate treatment strategies for dyspeptic patients. The primary objective of the study was to determine the prevalence of biopsy-proven *H pylori* in patients who underwent gastroscopy in Peace River, a rural northern Albertan community. Secondary objectives were to explore whether patient age, sex, geographic residence, and gastroscopic indications or findings were associated with *H pylori* infection.

METHODS

We performed a 2-year retrospective chart review (January 1, 2011, to December 31, 2012) of all patients who underwent gastroscopy at the Peace River Community Health Centre.

Peace River is a rural northern Albertan town, with 6774 residents and a surrounding population of 7252.¹² Two family physicians perform gastroscopies; one received additional training in gastrointestinal (GI) medicine (M.R.K.) and the other in surgery (R.I.G.). Both physicians receive referrals from throughout the Peace River region, and the closest general surgeons and gastroenterologists are 170 km and 500 km away, respectively.

Gastroscopy reports were retrospectively reviewed for patient demographic characteristics, gastroscopic indications and findings, and the use of nonsteroidal anti-inflammatory drugs (NSAIDs), including acetylsalicylic acid, as well as proton pump inhibitors (PPIs) at the time of gastroscopy. Indications for gastroscopy were adapted from the American Society of Gastrointestinal Endoscopy guidelines,¹³ while findings were modified from previous clinical primary care endoscopy research.¹¹ Findings were determined from the text of the endoscopic report and classified at the time of data collection. *Peptic ulcer disease* included both gastric and duodenal erosions and healing ulcers. Procedures could have more than 1 endoscopic indication or finding and

formal ranking of the clinical relevance of the indications and findings was not performed. Pathology reports of gastric biopsies were reviewed to determine *H pylori* infection status and other pathology including celiac disease, eosinophilic esophagitis, Barrett syndrome, and cancers. As PPI therapy might decrease the ability to detect *H pylori* on antral biopsies,² it was routine practice to perform additional biopsies of the proximal stomach (cardia or body) for patients taking PPIs.

The overall proportion of *H pylori* infection was calculated by examining the *H pylori* results from all gastroscopies performed in the study period, while the proportion of *H pylori* infection among first-time gastroscopy patients was calculated by examining the *H pylori* results only in patients undergoing their first gastroscopy. Patient charts were reviewed to determine whether gastroscopy had been performed before the study. The associations between age, sex, patient residence, and endoscopic indications and findings and *H pylori* status were evaluated in first-time gastroscopy patients. Patient residence was determined by the 6-digit postal code on file and patient age was categorized into 39 years and younger, 40 to 64 years, and 65 years and older to approximate clinically relevant tertiles.

Data analysis was performed using Cytel StatXact, version 10.0.0. The Cochran-Armitage trend test was used to compare results across the 3 age categories; otherwise, Fisher exact tests were used to determine statistical significance, with an α level of .05.

The study was approved by the Health Research Ethics Board of the University of Alberta in Edmonton.

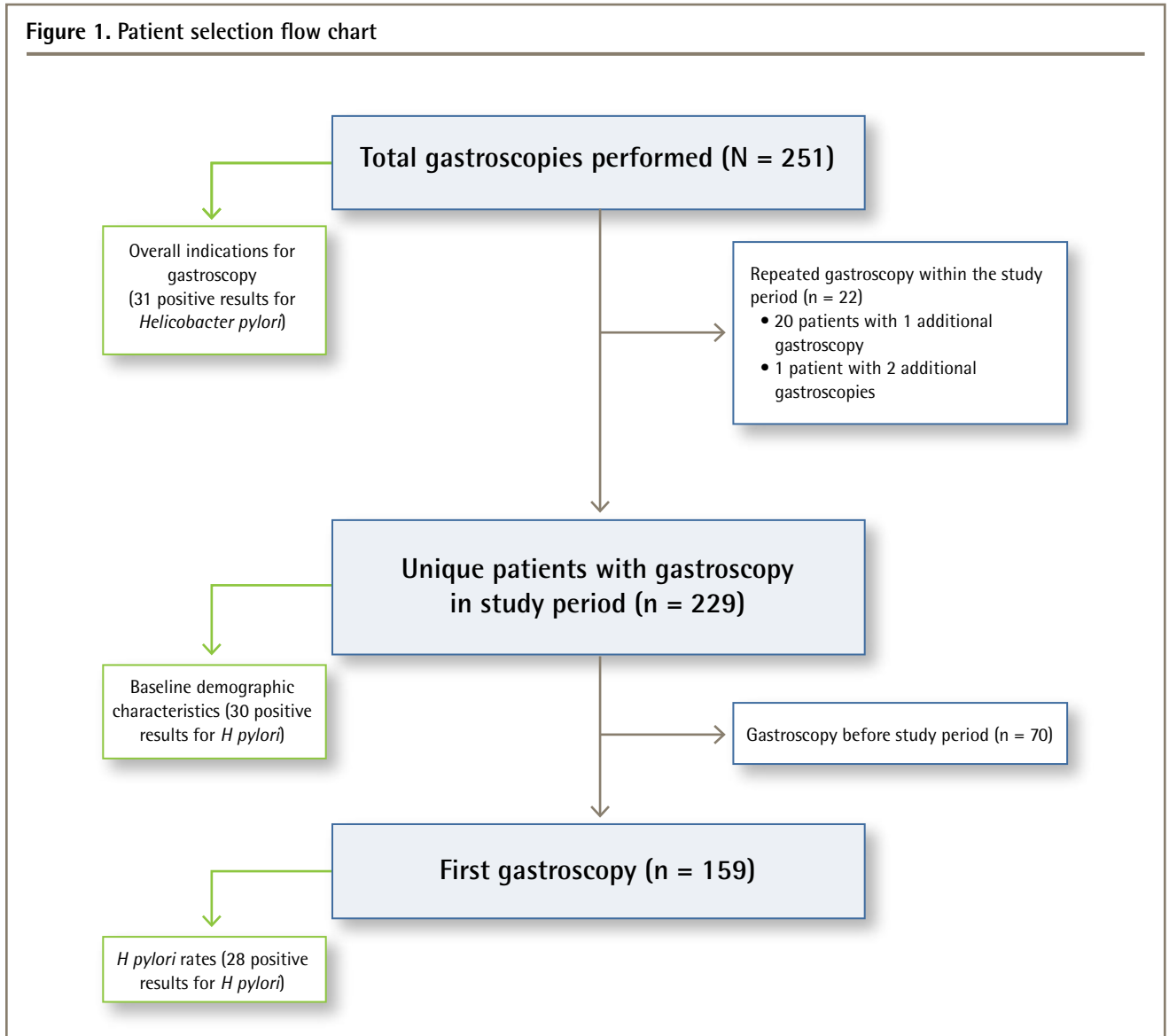
RESULTS

During the study period, 251 gastroscopies were performed in 229 unique patients (**Figure 1**). The mean (SD) patient age was 52.4 (16.1) years and 52.8% were women. Patients from across northwestern Alberta were served, with 52.0% of the patients residing in Peace River (**Table 1**). Overall, 159 gastroscopies (63.3%) were the patient's first gastroscopy. Among all patients, NSAID use was recorded in 134 cases and 70 of 134 patients (52.2%) were taking NSAIDs at the time of gastroscopy. Similarly, 157 endoscopy reports mentioned PPI status and 116 of 157 (73.9%) were taking PPIs at the time of endoscopy. Forty-one patients were taking both NSAIDs and PPIs. For the remaining patients, NSAID or PPI use was not mentioned in the endoscopic report and was therefore unknown.

Gastroscopy indications

There were 371 indications for the 251 gastroscopies, giving a mean of 1.5 indications per gastroscopy. The most common indications for gastroscopy were persistent upper

Figure 1. Patient selection flow chart



abdominal symptoms (predominantly dyspepsia) or symptoms suggestive of serious organic disease (38.2%); gastroesophageal reflux disease symptoms (including dysphagia or odynophagia [32.7%]); and follow-up from a previously documented endoscopic lesion (21.9%) (Figure 2). Compared with the other age categories, patients 39 years of age and younger were more likely to have a gastroscopy performed for upper abdominal symptoms ($P=.03$), while patients 65 years of age and older were more likely to have a gastroscopy performed for anemia ($P=.0005$).

Gastroscopy findings

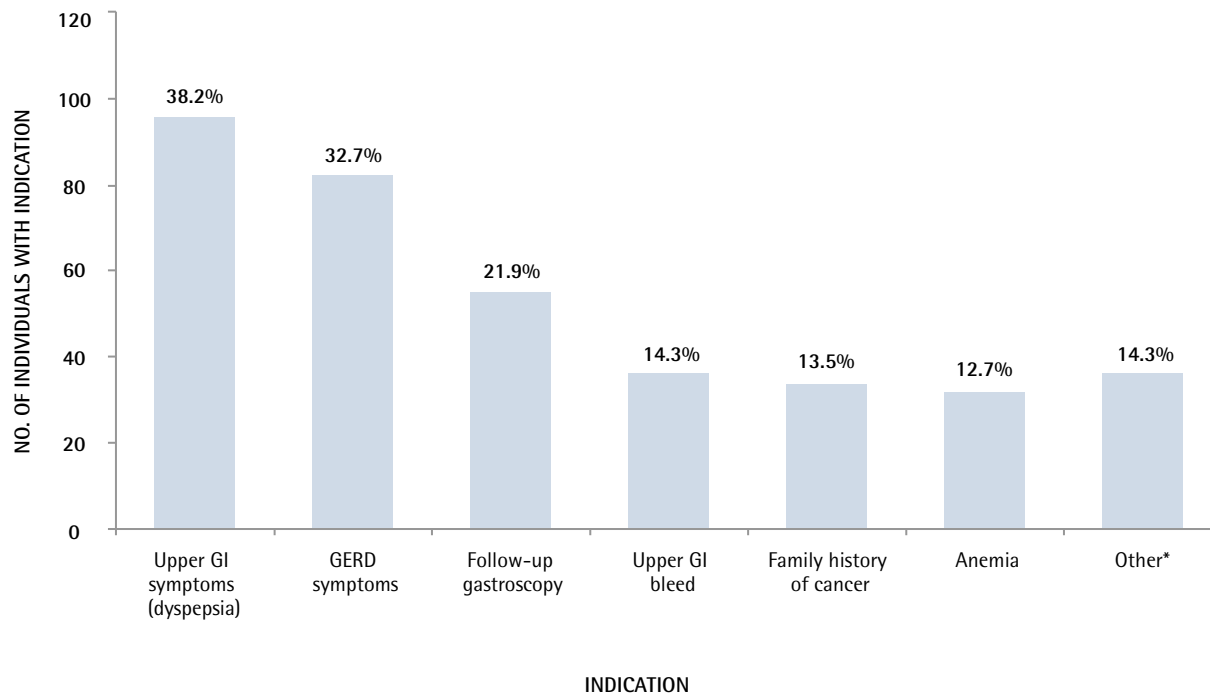
There were 294 clinically relevant endoscopic findings in the 251 gastroscopies, for a mean of 1.2 findings per gastroscopy. Overall, the most common findings were gastritis or duodenitis (68.1%), no findings (normal)

(20.3%), or PUD (17.5%) (Figure 3). Hiatus hernia and fundic gland polyps (found in 9.1% and 4.0% of procedures, respectively) were recorded but were not considered clinically relevant findings for our analyses.

Table 1. Patient demographic characteristics

CHARACTERISTIC	VALUE
Mean (SD) age, y	52.4 (16.1)
Age by group, y, n (%)	
• ≤ 39	46 (20.1)
• 40–64	133 (58.1)
• ≥ 65	50 (21.8)
Female sex, n (%)	121 (52.8)
Inpatient, n (%)	4 (1.7)
Resides outside of Peace River, Alta, n (%)	110 (48.0)

Figure 2. Individuals with indications for gastroscopy out of all gastroscopies performed: N = 251. Multiple indications per individual were possible.



GERD—gastroesophageal reflux disease, GI—gastrointestinal.

*Other indications included diagnosis of radiologically demonstrated lesions, and confirmation or investigation for celiac markers. Only 4 of 229 individuals had "other" as their sole indication.

Among all gastroscopies, there were 6 pathologically confirmed cases of Barrett syndrome (without dysplasia), 3 cases of eosinophilic esophagitis, and 4 cases of celiac disease. There were no cases of gastric or esophageal cancer or foreign bodies.

The likelihood of being diagnosed with PUD increased with age and the likelihood of having no findings on gastroscopy decreased with age, although these differences were not statistically significant ($P=.1$ and $P=.16$, respectively). All cases of eosinophilic esophagitis were in individuals 39 years of age and younger. Age was otherwise not associated with any gastroscopic findings.

First-time gastroscopy patients and NSAID use

Among first-time gastroscopy patients, NSAID use was noted in 99 endoscopic reports. Fifty-one patients (51.5%) were documented as taking NSAIDs at the time of gastroscopy. In patients having their first gastroscopy, and in whom NSAID status was known, 14 of 18 (77.8%) patients diagnosed with PUD were taking NSAIDs. The odds of finding PUD on gastroscopy were 4.2 (95% CI 1.3 to 13.0) times higher among NSAID users than nonusers.

Prevalence and incidence of *H pylori*

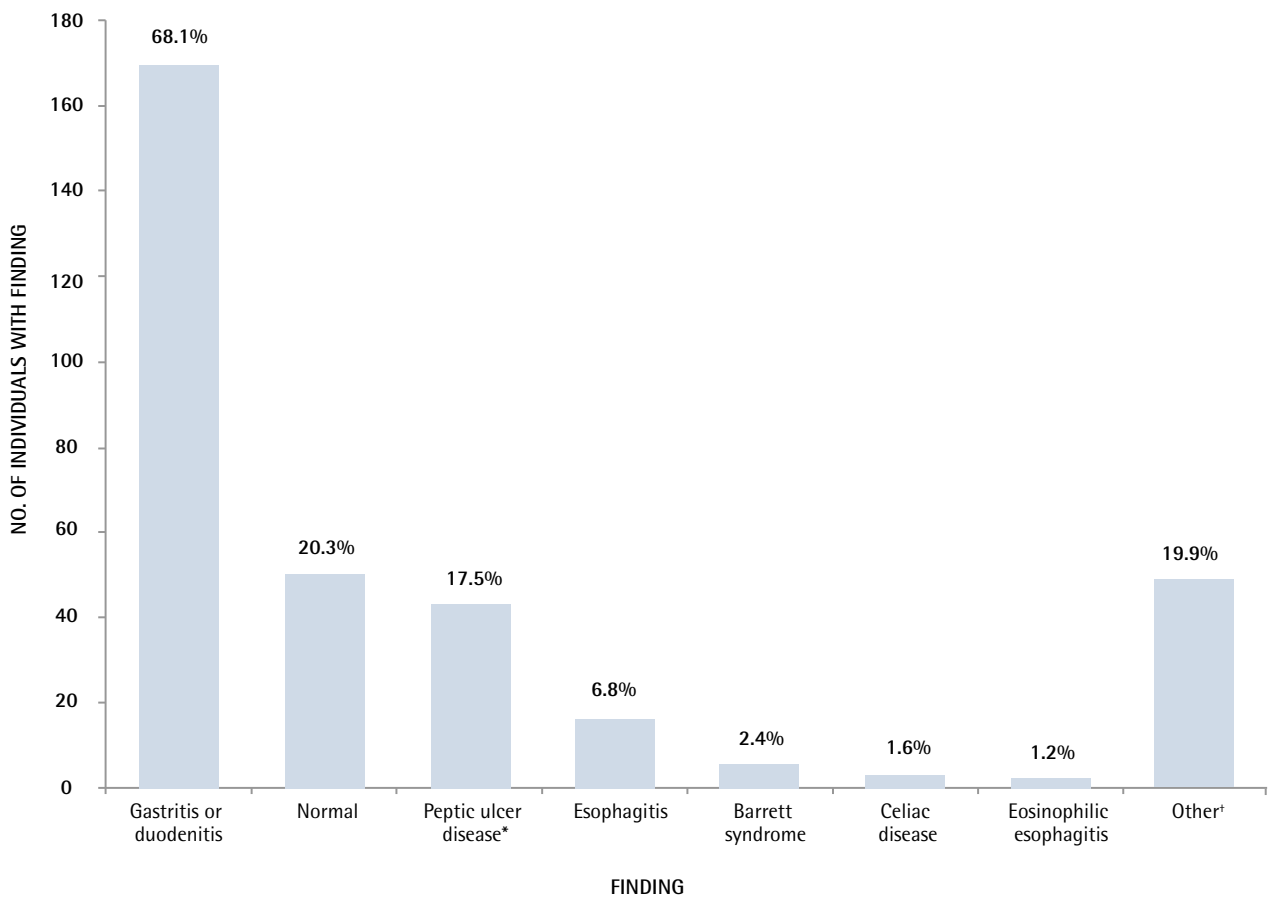
Of all the gastroscopies performed (N=251), biopsies for *H pylori* were performed in 237 (94.4%) cases. All 14 procedures without *H pylori* biopsy were for patients who had been previously documented as having negative results for *H pylori*. Three study patients had positive test results for *H pylori* and had a previously documented gastroscopy. Two patients had a gastroscopy without biopsies performed before the study period, while 1 patient had a persistent *H pylori* infection at a repeat gastroscopy within the study period. Overall, 31 of 251 gastroscopies had positive results for *H pylori* (12.4%; 95% CI 8.3% to 16.4%).

All first-time gastroscopies (n=159) included a biopsy for *H pylori*, and 28 had positive results for *H pylori* (17.6%; 95% CI 11.7% to 23.5%).

Predictive factors for *H pylori* on first-time gastroscopy

To determine possible predictive factors of *H pylori* infection, we calculated the association between *H pylori* status and various patient factors among patients undergoing first-time gastroscopy (n=159).

Figure 3. Individuals who had endoscopic findings out of all gastroscopies performed: $N = 251$. Multiple findings per individual were possible.



*Peptic ulcer disease included gastric and duodenal erosions or healing ulcers.

†Other findings included fundic gland polyps, hiatus hernia, lax lower esophageal sphincter, gastric outlet obstruction, and Schatzki ring. Only 5 of 229 individuals had "other" as their sole finding.

Patient demographic characteristics and *H pylori* incidence. Positive results for *H pylori* were not significantly different among women (13.8%; 95% CI 6.2% to 21.3%) and men (21.5%; 95% CI 12.5% to 30.6%; $P = .2$). Although positive results for *H pylori* increased with age (≤ 39 years, 12.4%; 40 to 64 years, 18.0%, ≥ 65 years, 24.1%), this trend was not statistically significant ($P = .21$). Positive results for *H pylori* did not differ between residents of Peace River and those living outside of Peace River (19.8% vs 15.4%; $P = .54$).

Endoscopic indications and findings, and *H pylori* rates. The relative risk of *H pylori* infection was 2.9 times higher (22.4% vs 7.7%; $P = .03$) among individuals with *H pylori*-associated endoscopic indications (upper abdominal symptoms, upper GI bleeding, anemia, or family history of gastric cancer) compared with

endoscopic indications not associated with *H pylori* infection (such as gastroesophageal reflux disease or other esophageal symptoms).

Helicobacter pylori infection was more common in patients with PUD than in those who did not have PUD; however, this difference was not statistically significant (29.2% vs 15.6%; $P = .14$).

DISCUSSION

Among patients receiving gastroscopy in rural northern Alberta's Peace River region, *H pylori* was found in 12.4% of all cases and 17.6% of first-time gastroscopies. These results are lower than rates previously reported in Canada.

While the overall prevalence of *H pylori* in Canada has been estimated to be around 25%,^{5,6} substantial

differences are seen in certain populations and jurisdictions. The most noteworthy of these differences are the elevated *H pylori* rates in the Inuit population, in some First Nations communities, and in immigrants to Canada from *H pylori*-endemic countries.⁷

A population-based study of 333 predominately Inuit and aboriginal peoples from Aklavik, NWT, reported a 58% *H pylori* prevalence using urea breath tests.¹⁴ Two earlier studies using immunoglobulin G serology to determine past or current *H pylori* infection in Arctic and Manitoba First Nations communities found 50.8% and 95% of individuals, respectively, had positive test results.^{15,16}

Our study differs from these studies as we determined *H pylori* status only among patients who underwent gastroscopy, and therefore it is not a population-based study. By design, our population included only individuals requiring invasive investigation of their symptoms. As such, one would postulate that the proportion of patients who had positive test results for *H pylori* would be higher in our study relative to the rest of the population in the region.

A study more similar to ours, from Sioux Lookout, Ont, reported that 37.9% of 203 patients who underwent gastroscopy and gastric biopsies had positive results for *H pylori*.¹⁷ In this study, endoscopists selectively performed biopsies for *H pylori* depending on the clinical indication, and therefore might have overestimated the true proportion of patients with *H pylori* infection.

Finally, in the CADET-PE (Canadian Adult Dyspepsia Empiric Treatment—Prompt Endoscopy) study, Canadian patients with dyspepsia (predominantly from eastern Canada) who underwent prompt endoscopy had positive results for *H pylori* 30% of the time.⁶ Whether this difference in *H pylori* rates reflects a temporal decline (the CADET-PE study was done about 15 years ago) or geographic differences between populations studied is not known.

In our study, gastric biopsies were performed on all patients undergoing their first gastroscopy, regardless of clinical indication. Patients known to have previous negative results for *H pylori* or who had previously confirmed *H pylori* eradication were not biopsied owing to the low rate of *H pylori* recurrence in adults in developed countries.¹⁸ We also found that patients with an *H pylori*-related indication for gastroscopy (upper abdominal symptoms, upper GI bleeding, anemia, or family history of gastric cancer) were nearly 3 times more likely to have an *H pylori* infection compared with those who did not have such an indication.

Consensus guidelines suggest the “test and treat” approach for uninvestigated young individuals with dyspepsia (without alarm features) is appropriate if baseline *H pylori* prevalence is 20% or greater.² Our enhanced understanding of gastroscopy indications associated with *H pylori* infection, combined with our knowledge of

the low overall proportion of patients who have positive results for *H pylori* in the Peace River region, can have a meaningful influence on clinical practice. First, for patients with dyspepsia, discontinuation of NSAIDs and empiric trial of PPIs have been demonstrated to provide equivalent patient outcomes¹⁹ with cost savings²⁰ compared with the test and treat approach. Given the relatively low proportion of patients infected with *H pylori* and moderate NSAID use, NSAID cessation and empiric PPI prescription might be a reasonable first step before testing for *H pylori* in patients with dyspepsia in the Peace River region.

In regions where *H pylori* prevalence is low, endoscopists could use clinical indications and endoscopic findings to determine which patients might be at a higher risk of *H pylori* infection (ie, require gastroscopic biopsy) and which might not. Using a more selective threshold to perform biopsies could reduce endoscopy-associated system costs while still capturing most cases of *H pylori* infection.

It is possible that the low *H pylori* findings reflect a temporal decline in *H pylori* prevalence. Such a trend has been demonstrated in other jurisdictions^{8,9}; however, as we do not have previously documented *H pylori* rates from the Peace River region, we are unable to confirm this. Alternatively, our findings might reflect earlier testing and treatment of *H pylori* by noninvasive methods (such as the urea breath test). To more precisely determine the regional *H pylori* prevalence, a population-based study including all methods of determining *H pylori* status is needed.

This study demonstrated that the odds of having a peptic ulcer were more than 4 times higher among NSAID users than nonusers. While the association between PUD and NSAIDs is well known,²¹ these findings should be tempered by the fact that NSAID status was unknown in many patients. However, even if we assume that none of the patients in whom NSAID use was not known were using NSAIDs, a minimum of 51 of 229 patients (22.3%) would have been taking NSAIDs. This supports the need for judicious medication reviews (including over-the-counter medications such as acetylsalicylic acid) among individuals with GI complaints.

Limitations

Our study has several limitations. Owing to the limited study duration, our sample size was relatively small. This likely contributed to many of our results not reaching statistical significance. In addition, many of the patients with previous gastroscopy had undergone the procedure before the initiation of our electronic medical records. This fact combined with the limited resources of our study team rendered it not feasible to formally analyze the results of all preceding gastroscopies performed before the commencement of our study.

Consistent with a previous Canadian study that reported no rural-urban difference in *H pylori* rates,²² our study did not find differences in *H pylori* infection status between patients living within or outside of Peace River. However, in our study, it became apparent that the mailing addresses were not always consistent with a patient's actual place of residence, thus limiting the accuracy of our geographic analyses. This limitation affected our ability to determine whether, as has been found in other Canadian studies,¹⁴⁻¹⁷ *H pylori* infection is more common among patients living in First Nations communities. In addition, other studies have correlated *H pylori* infection with households that have a greater number of children and lower socioeconomic status.^{5,7} These variables are not routinely included in endoscopy reports and, therefore, were not captured by our study. Finally, as with all retrospective studies, our data were limited by the amount and quality of information captured by the original endoscopy reports.²³ For example, the inconsistent reporting of NSAID use limits the ability to draw definitive conclusions about the influence of NSAIDs on endoscopic findings and requires prospective studies to fully ascertain.

Conclusion

We found that 12.4% of patients who underwent gastroscopy in the rural Peace River region of northern Alberta had positive results for *H pylori*, approximately half of the reported national average. Positive results for *H pylori* were higher among individuals with a first-time gastroscopy (17.6%) and among individuals with *H pylori*-associated indications for gastroscopy, notably dyspepsia.

Given the moderate use of NSAIDs in our population undergoing gastroscopy, patients in the Peace River region are likely to benefit from cessation of NSAIDs and initiation of empiric PPI therapy as a first step, before further *H pylori* testing is done. Our findings also suggest that selectively performing *H pylori* biopsies in patients with *H pylori*-associated endoscopic indications or findings could be considered with minimal adverse implications for patients and potential cost savings.

Population-based research is required to better ascertain temporal and regional differences in *H pylori* prevalence. 🌱

Dr Colmers-Gray was a medical student at the University of Alberta in Edmonton at the time of the study, and is now an emergency medicine resident. **Mr Vandermeer** is a biostatistician in the Alberta Research Centre for Health Evidence in the Department of Pediatrics at the University of Alberta. **Dr Greidanus** is a family physician in the Peace River Community Health Centre. **Dr Kolber** is Associate Professor in the Department of Family Medicine at the University of Alberta and a family physician in Peace River.

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Contributors

Drs Kolber and **Colmers-Gray** contributed to the concept and design of the study, and data gathering, analysis, and interpretation. **Dr Greidanus** contributed to the

data gathering and interpretation. **Mr Vandermeer** performed statistical analysis. All authors contributed to preparing the manuscript for publication.

Competing interests

None declared

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