

Investigating antibiotic dispensation rates by age, gender and antibiotic class among participants of community *H. pylori* projects in Arctic Canada



Kathleen Williams¹, Emily Walker², Rachel Munday⁴, Monika Keelan³, Yutaka Yasui¹, Karen J Goodman^{1,2} & the CANHelp Working Group
 (1) School of Public Health, (2) Department of Medicine, (3) Department of Laboratory Medicine & Pathology, University of Alberta, Edmonton, AB, Canada; (4) Susie Husky Health Centre, Aklavik, Northwest Territories, Canada

Introduction

Helicobacter pylori are bacteria that colonize the stomach. Chronic *H. pylori* infection is a risk factor for peptic ulcers and gastric cancer.

Treatment to eliminate *H. pylori* infection requires a multi-drug regimen consisting of a proton pump inhibitor with two or more antibiotics taken for a period of 10 to 14 days. Antibiotics used commonly in anti-*H. pylori* treatment regimens include clarithromycin, metronidazole and amoxicillin.



Community-driven research on *H. pylori* infection conducted by the Canadian North *Helicobacter pylori* (CANHelp) Working Group shows frequent *H. pylori* treatment failure in Arctic communities with *H. pylori* prevalence estimates ranging from 57% to 68%.

Infection with antibiotic-resistant strains of *H. pylori* has been identified as a major factor associated with failure of treatments aimed at eliminating *H. pylori* infection. Previous antibiotic exposure for the treatment of unrelated bacterial infections is a risk factor for antibiotic-resistant *H. pylori* infection.

This analysis describes antibiotic dispensation rates, as a measure of antibiotic exposure history, by community, gender, age and antibiotic class in Canadian Arctic communities and a comparison group comprising the outpatient population in Edmonton, Alberta.

Methods

This analysis includes 297 participants in community projects conducted by the CANHelp Working Group in Aklavik, Tuktoyaktuk, Fort McPherson, NT, and Old Crow, YT.

We developed a chart review tool to standardize collection of information from medical charts. We collected antibiotic prescription histories for the 5-year period prior to enrolment for each participant; enrolment occurred during 2007-2012. Collected data included frequency of antibiotic prescriptions and antibiotic type prescribed.

Microbiology lab technicians characterized the antibiotic susceptibility of *H. pylori* isolates cultured from gastric biopsies collected during upper GI endoscopy performed in community health centres.

We obtained data on the dispensation of antibiotics in Edmonton, Alberta during 2010-2013 from the provincial Interactive Health Data Application (IHDA) which incorporates data from the following sources: Pharmaceutical Information Network (PIN) Database, Alberta Health Care Insurance Plan (AHCIP) Adjusted Mid-Year Population Registry Files, and Alberta Health and Wellness Postal Code Translation File (PCTF). Data obtained from IHDA was restricted to the Edmonton City Centre, which includes the population residing in the city limits.

We calculated the antibiotic dispensation rate for Arctic communities as follows:

$$\text{Number of antibiotic courses dispensed} / (\text{Number of participants} * \text{Years followed in medical charts})$$

We calculated the antibiotic dispensation rate for Edmonton as follows:

$$\text{Number of antibiotic courses dispensed} / \text{Sum of population size for years 2010-2013}$$

The rate difference was calculated as follows:

$$\text{Dispensation rate in Arctic Communities} - \text{Dispensation rate in Edmonton City Centre}$$



Results

Table 1: Antibiotic dispensation rate by community.*

	Antibiotic Courses Dispensed per 100 persons per year	95% CI
All Arctic Communities (N=297)	89	84, 94
Aklavik (N=164)	84	78, 91
Old Crow (N=67)	90	80, 101
Fort McPherson (N=52)	82	71, 93
Edmonton City Centre**	55.46	55.38, 55.54
Rate Difference comparing all Arctic Communities to Edmonton	33	29, 38

*Due to small sample size (n=14) individual estimates are not presented for Tuktoyaktuk, NT.
 **Edmonton City Centre population, including both genders and all ages, during 2010-2013 ranged from 830,213 to 903,256.

Table 2: Antibiotic dispensation rate by gender, age and antibiotic class in Arctic communities compared to the Edmonton City Centre.

	Antibiotic Courses Dispensed per 100 persons per year (95% CI)	
	Arctic Communities	Edmonton City Centre
Gender		
Male	64 (58, 71)	44.97 (44.87, 45.07)
Female	109 (102, 117)	66.22 (66.11, 66.35)
Age Group		
<60 years of age	85 (79, 90)	51.38 (51.31, 51.47)
≥60 years of age	111 (98, 126)	76.75 (76.52, 76.98)
Antibiotic Class		
β-lactams	31 (28, 33)	15.09 (15.05, 15.13)
Macrolides	11 (10, 13)	9.71 (9.68, 9.75)
Nitroimidazoles	6 (5, 7)	0.06 (0.06, 0.07)
Nitrofurans	4 (3, 5)	2.27 (2.25, 2.29)
Fluoroquinolones	3 (3, 4)	7.76 (7.74, 7.79)
Tetracyclines	2 (1, 2)	4.29 (4.27, 4.32)

Table 3: Percent of *H. pylori* organisms classified as resistant to specific antibiotics among isolates from gastric biopsies taken from residents of Arctic communities, by gender.

Antibiotic Subtype	(Antibiotic Class)	Male (n=88)	Female (n=106)	Total (n=194)
Metronidazole	(Nitroimidazole)	31%	40%	36%
Clarithromycin	(Macrolide)	8%	23%	16%
Ciprofloxacin	(Fluoroquinolone)	3%	5%	4%
Rifampicin	(Rifamycin)	2%	-	1%
Nitrofurantoin	(Nitrofurans)	1%	1%	1%
Tetracycline	(Tetracycline)	-	1%	0.5%
Amoxicillin	(β-lactam)	-	-	-



Summary/Conclusion

The results of this preliminary analysis show:

- A notably higher estimated antibiotic dispensation rate among residents of Arctic communities relative to the outpatient population of Edmonton (a major city in southern Canada);
- A higher antibiotic dispensation rate in females relative to males in Arctic communities and Edmonton;
- A higher antibiotic dispensation rate in individuals ≥60 years of age relative to individuals <60 years of age in Arctic communities and Edmonton;
- A high dispensation rate in Arctic communities and Edmonton for β-lactam antibiotics (the class that includes amoxicillin) and macrolide antibiotics (the class that includes clarithromycin).

Among participants of CANHelp Working Group community projects that were included in this analysis, the higher antibiotic dispensation rate in participating females relative to males is consistent with the higher frequency of antibiotic-resistant *H. pylori* infection in participating females relative to males.

Next Steps

Future analysis will estimate the effect of frequent exposure to antibiotics on the prevalence of resistant *H. pylori* infection and on the risk of treatment failure, controlling for age, sex, community and other potential confounders.



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