Dietary factors and prevalence of severe gastritis in an *Helicobacter pylori* infected population from northern Canada

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CANHelp Working Group
Background

Canadians at High Risk of *H. pylori* Infection

- In 2006, the Canadian *Helicobacter* Study Group identified 3 groups of Canadians at high risk from *Helicobacter pylori*-associated disease:
  - Elderly people
  - Immigrants from high-prevalence regions
  - Aboriginal peoples
Background

*H. pylori* and Associated Diseases in Aboriginal Peoples of Canada
Background

*H. pylori* and Associated Diseases in Aboriginal Peoples of Canada

- Three main diseases associated with *H. pylori* infection:
  1. Gastritis
  2. Peptic Ulcer Disease (PUD)
  3. Gastric Cancer
**H. pylori** and Gastric Cancer

- **Worldwide:**
  - 4th most common cancer
  - 2nd leading cause of cancer-related death

- **Epidemiological evidence for risk factors:**
  - Infection with *H. pylori*
  - Smoking
  - Chronic gastritis, Intestinal metaplasia
  - Dietary factors
    - Salted, smoked, pickled foods
    - Dried fish & meats
    - Fruits & vegetables: protective effect

**H. pylori** and Peptic Ulcer Disease & Gastritis

- Interesting history!
  - Early years (mid-20th century) – “known fact” bacteria could not survive in stomach
    - Stress hypothesis: stress $\rightarrow$ PUD
    - *H. pylori* hypothesis:
      - *H. pylori* $\rightarrow$ PUD & gastritis
**H. pylori** and Peptic Ulcer Disease & Gastritis

- Lancet: Saturday 16 June 1984:

  **UNIDENTIFIED CURVED BACILLI IN THE STOMACH OF PATIENTS WITH GASTRITIS AND PEPTIC ULCERATION**

- Won Nobel Prize (2005):
  - Discovery of the bacterium *H. pylori* and its role in **gastritis** and peptic ulcer disease

Barry J. Marshall - Interview. Nobelprize.org. 8 Nov 2010
H. pylori and PUD / Gastritis: Other Risk Factors??

- Peptic Ulcer Disease
  - Prospective Danish Cohort (2003):
    - Tobacco smoking
    - Alcohol (spirits)
    - Mild tranquilizers
    - Protective: Alcohol (wine)
  - Prospective US Cohort (1997):
    - Weak association with coffee, tobacco smoking, alcohol

- Chronic Gastritis:
  - Older age
  - Use of NSAIDS
  - Tobacco smoking
  - Alcohol
  - ?? Caffeine

*H. pylori* and Associated Diseases
Mechanism of Gastric Carcinogenesis

- Infection of *H. pylori*
- Progressive gastritis
- Intestinal metaplasia
- Atrophy
- Gastric Cancer
Little Data on *H. pylori*-associated Gastric Cancer in Aboriginal Canadians

Northwest Territories, 1998-2007

- Compared to Canadian average, age-adjusted incidence rates are increased in:
  - NWT men (2x Canadian rate)
  - First Nations and Inuit men in NWT, *and also*
    - Alaska Native men relative to US average
    - Native Greenlanders relative to Danes
  - But not in Manitoba Registered Indians (*Bernstein 1999*)
Little Data on H. *pylori*-associated **Peptic Ulcer Disease** in Aboriginal Canadians

- Increased ratio of gastric to duodenal ulcer
  - Inuit of northern Labrador, *and also*
    - *Alaska Natives*
    - *Native Greenlanders*
    - *Residents of Arctic Norway*
  - Increased hospitalizations associated with PUD diagnoses
    - In Manitoba, Registered Indians had nearly 2x rate of other persons
      *(Bernstein 1999)*
Little Data on H. *pylori*-associated Atrophic Gastritis prevalence

- Although gastritis is an important step in the pathway of gastric cancer, data on prevalence are rare and even non-existent for most countries of the world
  - Common among elderly
  - Prevalence varies widely
    - Norway (1991): 50.5%
    - Australia (1993): 22%
    - Japan (1996): 52.9%
    - China (1998): 82.2%
    - Sweden (2000): 28%
Addressing Concerns about Health Risks from *H. pylori* infection in Northern Canada
Initial Research Project

Aklavik *H. pylori* Project Goals

1. Investigate *H. pylori* infection in Aklavik
2. Include community members in research planning and conduct
3. Develop effective activities to inform community members of the research results
Aklavik *H. pylori* Project

*Integrating Scientific and Patient Care Goals*

- 6 Components:
  - Screen residents for *H. pylori* infection (UBT)
  - Questionnaire Data
  - Endoscopy
  - Treatment
  - Knowledge Exchange
  - Policy Development
Aklavik *H. pylori* Project

Endoscopy
Aklavik *H. pylori* Project

**Endoscopy**

- Aklavik residents aged $\geq 15$ years targeted
- Children (10-14 years) enrolled at parents’ request
- Endoscopies performed in Aklavik Health Centre by visiting gastroenterologists (Feb 2008)
- Equipment transported temporarily to Health Center
- Transnasal ultrathin gastrosopes
- 5 gastric biopsies obtained from each participant
Biopsies were obtained from 194 individuals (42% men)
Participants were primarily Inuvialuit (Inuit) or Gwich’in Dene (Athabascan First Nations)
Participants were aged 10-80

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwich'in</td>
<td>53</td>
<td>27</td>
</tr>
<tr>
<td>Inuvialuit</td>
<td>114</td>
<td>59</td>
</tr>
<tr>
<td>Other Aboriginal</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Non-Aboriginal</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-17</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>18-29</td>
<td>42</td>
<td>22</td>
</tr>
<tr>
<td>30-49</td>
<td>75</td>
<td>39</td>
</tr>
<tr>
<td>50-69</td>
<td>47</td>
<td>24</td>
</tr>
<tr>
<td>70-80</td>
<td>11</td>
<td>5</td>
</tr>
</tbody>
</table>
## Aklavik *H. pylori* Project

### Endoscopic Abnormalities

<table>
<thead>
<tr>
<th>Apparent Inflammation</th>
<th>Gastritis</th>
<th>13.8%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duodenitis</td>
<td>6.7%</td>
</tr>
<tr>
<td>Erosions</td>
<td>Gastric</td>
<td>6.2%</td>
</tr>
<tr>
<td></td>
<td>Duodenal</td>
<td>0.5%</td>
</tr>
<tr>
<td>Ulcers</td>
<td>Gastric</td>
<td>3.1%</td>
</tr>
<tr>
<td></td>
<td>Duodenal</td>
<td>0</td>
</tr>
<tr>
<td>Cancer</td>
<td>Cancer</td>
<td>0</td>
</tr>
</tbody>
</table>
# Aklavik *H. pylori* Project

## Histopathology

Prevalence of selected histopathology classifications

<table>
<thead>
<tr>
<th></th>
<th>All <em>H. pylori</em>+</th>
<th>All participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>129</td>
<td>194</td>
</tr>
<tr>
<td><strong>Inflammation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild (%)</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Moderate (%)</td>
<td>47</td>
<td>31</td>
</tr>
<tr>
<td>Severe (%)</td>
<td>43</td>
<td>29</td>
</tr>
<tr>
<td>Atrophy (%)</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>Intestinal Metaplasia (%)</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>
Methods: Assessing Dietary Factors and prevalence of Severe Gastritis

1. Used data from the \textit{H. pylori} + subjects who completed both the endoscopy with biopsies and individual epidemiological questionnaire

   - Endoscopy: \( n = 129 \)
   - Endoscopy + questionnaire: \( n = 107 \)

2. Used descriptive statistics to identify some dietary factors potentially associated with severe gastritis
Methods: Dietary Questionnaire

- Dietary data available for 107 / 129 subjects

<table>
<thead>
<tr>
<th>Diet</th>
<th>in past week</th>
<th>in a typical week in summer</th>
<th>in a typical week in winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Approximate serving sizes specified)</td>
<td>(If unsure enter “777”, if refused to answer enter “999”)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Fresh fruit (1 whole or ½ cup diced)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Fruit juice (from real fruit)</td>
<td>4</td>
<td>LESS</td>
<td>4</td>
</tr>
<tr>
<td>(½ cup = 4 oz, small glass)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Raw vegetables (½ cup)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>11. Cooked vegetables (½ cup)</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>12. Fresh or frozen fish, caught locally</td>
<td>1</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>(6-8 oz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Fresh or frozen unprocessed fish,</td>
<td>0</td>
<td>0</td>
<td>&lt;1</td>
</tr>
<tr>
<td>store-bought (6-8 oz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Uncooked fish or fish eggs</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(fresh or frozen) (6-8 oz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Smoked, salted, or cured fish</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(6-8 oz)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Results: Dietary Questionnaire

<table>
<thead>
<tr>
<th>Dietary Factor</th>
<th>Number of (H.\text{Pylori}^+) Participants (max n = 107)</th>
<th>% with severe gastritis (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 1) serving / day</td>
<td>62</td>
<td>37 (25-50)</td>
</tr>
<tr>
<td>&gt; 1 serving / day</td>
<td>43</td>
<td>51 (35-67)</td>
</tr>
<tr>
<td>Coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 1) serving / day</td>
<td>42</td>
<td>52 (36-68)</td>
</tr>
<tr>
<td>&gt; 1 serving / day</td>
<td>62</td>
<td>35 (24-49)</td>
</tr>
<tr>
<td>Tea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 1) serving / day</td>
<td>58</td>
<td>52 (38-65)</td>
</tr>
<tr>
<td>&gt; 1 serving / day</td>
<td>47</td>
<td>32 (19-47)</td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 1) serving / day</td>
<td>19</td>
<td>47 (24-71)</td>
</tr>
<tr>
<td>&gt; 1 serving / day</td>
<td>87</td>
<td>43 (32-54)</td>
</tr>
<tr>
<td>Fruit / vegetable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\leq 1) serving / day</td>
<td>49</td>
<td>39 (25-54)</td>
</tr>
<tr>
<td>&gt; 1 serving / day</td>
<td>53</td>
<td>49 (35-63)</td>
</tr>
<tr>
<td>Smoked / salted meat or fish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 2 servings / week</td>
<td>78</td>
<td>41 (30-53)</td>
</tr>
<tr>
<td>(\geq 2) servings / week</td>
<td>27</td>
<td>52 (32-71)</td>
</tr>
</tbody>
</table>
Aklavik *H. pylori* Project Summary

- High prevalence of *H. pylori* infection with elevated frequencies of:
  - Severe Gastritis
  - Gastric atrophy
  - Intestinal metaplasia

- Dietary factors associated with severe gastritis:
  - ↑ Pop
  - ↑ Smoked / salted meat & fish
  - ↑ Fruit & Vegetables
  - ↓ Alcohol
  - ↓ Coffee
  - ↓ Tea
Aklavik H. pylori Project
Limitations

- Potential for:
  - Confounding from unadjusted analysis
  - Selection bias
    - ?? “Volunteer bias”
  - Questionnaire answers deviating from truth due to social desirability

- Small sample size
CANHelp Working Group
Next Steps… plans to expand

- 6 Yukon First Nations Communities
- 5 Inuvialuit Settlement Region Communities
- International Collaboration
  - Alaska
  - Greenland