Helicobacter pylori infections in Navajo communities of Northern Arizona

Robin B Harris[1,2], Priscilla R Sanderson[3], Carmenlita Chief[3], Rachelle Begay[1], Fernando Monroy[3], Heidi Brown[1], Eyal Oren[4]

[1]Zuckerman College of Public Health, University of Arizona, Tucson, AZ, USA; [2]Arizona Cancer Center, University of Arizona, Tucson, AZ, USA; [3]Northern Arizona University, Flagstaff AZ, USA; [4]San Diego State University, San Diego, CA, USA

OBJECTIVES

This pilot study, conducted through tribal-university partnerships, estimates the prevalence of *H pylori* infection in selected Navajo Chapters and identifies initial factors associated with the infection.

BACKGROUND

- *Helicobacter pylori* (*H. pylori*) is a gastric infection associated with development of types of ulcers and stomach cancer. Although incidence and mortality have decreased over time, stomach cancer is currently the fifth most common cancer in the world and the third leading cause of cancer-related mortality *(Rawla, 2019)*.
- Rates for stomach cancer in the US have decreased dramatically; although there are substantial variation by race and ethnicity.
  - Rates are approximately three times higher among Native Americans of Northern Arizona than general Arizona population and it is the leading cause of cancer mortality *(Navajo Cancer Report 2018)*.
- Adenocarcinomas are the most common type of gastric cancer and are primarily classified as cardia and non-cardia based on their anatomic site and 89% of cases of the non-cardia subtype are associated with the *H. pylori* *(Plummer 2015)*.
- The prevalence of *H. pylori* is unknown as well as the subtype of *H. pylori* present in Native American populations in Southwest U.S..

METHODS

- Household-based cross-sectional survey conducted in southwest of Navajo Nation from 3 chapters. The three chapters are located in southwestern part of Navajo Nation. Total population ~3200 with average population density between 50-75/square mile.
- Random sample of households selected using **c**ensus block vectors for tribal lands overlaid onto satellite imagery. Houses 'ground-truthed' for eligibility and residents approached for participation. Sample size goals selected to represent population distribution of the three communities
- Field teams interviewed households between June-August, 2018. Teams included Navajo Community Health Representatives (CHRs), staff & students from NAU & UA.
- Participants completed questionnaires and a urea breath test (UBT) to test for active infection.
- Prevalence estimated for demographic groups. Logistic regression, adjusted for household clustering, used to calculate odds ratios (aOR) and 95% confidence intervals (CI) for associations between UBT results and individual and household factors.

Characteristics of participants in the Navajo Healthy Stomach Study (N=101) by UBT Result.

Characteristics	Overall N = 101 n (%)	UBT Positive N = 66 n (%)	UBT Negative N = 35 n (%)	P[b]
Sex				0.03
Male	42 (40.0)	32 (48.5)	9 (25.7)	
Female	63 (60.0)	34 (51.5)	26 (74.3)	
Age, yrs				0.43
18-29	11 (8.6)	8 (11.9)	3 (8.6)	
30-49	28 (20.0)	19 (28.4)	7 (20.0)	
50-64	24 (31.4)	13 (19.4)	11 (31.4)	
65-79	31 (34.3)	18 (26.9)	12 (34.3)	
80+	11 (11.3)	9 (13.4)	2 (5.7)	
Age, yrs, dichotomized				0.22
<50	39 (37.1)	27 (40.9)	10 (28.6)	
≥ 50	66 (62.9)	39 (59.1)	25 (71.4)	
Education				0.78
< High School	35 (33.3)	22 (33.3)	13 (37.7)	
≥ High School/GED	68 (64.8)	42 (63.6)	22 (62.9)	
Missing	2 (1.9)	2 (3.0)	-	
Water Source				0.02
Regulated (piped, bottled)	78 (74.3)	43 (65.2)	32 (91.4)	
Unregulated (spring, well)	19 (18.1)	16 (24.2)	2 (5.7)	
Mix	8 (7.6)	7 (10.6)	1 (2.9)	
Clinical				
Ulcers (previous history)	4 (3.8)	2 (3.0)	2 (5.7)	0.51
Gallstone (previous history)	25 (23.8)	14 (21.2)	10 (28.6)	0.41
Household				
Have electricity	94 (94.0)	60 (92.3)	34 (97.1)	0.33
Have refrigerator	94 (94.0)	60 (92.3)	34 (97.1)	0.33
Travel over 1 hour for groceries	86 (86.9)	56 (87.5)	30 (87.5)	0.80

Abbreviations: UBT, Urea Breath Test
Missing baseline data ranged from 0% to 8.5%

Extensive community and university approval process required.

- Secured approval from 3 Navajo Nation chapters (similar to villages), 2 agencies (similar to counties covering a geographical area), Navajo Nation Human Research Review Board, UA and NAU IRB committees.
- Returned results to participants and to communities & agencies

Response

143 houses found & eligible

72 households recruited

105 participants

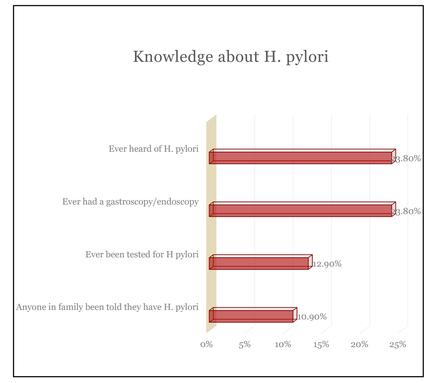
101 valid UBT results

RESULTS

Association between risk factors and prevalence of *H. pylori* infection as determined by urea breath test

Characteristics	UBT Positive Pos/Total (%)	Univariate Model OR (95% CI)	Logistic Model 1[a] OR (95% CI)	Logistic Model 2[b] OR (95% CI)
Overall	66/101 (65.3)			
Sex				
Female	34/60 (56.7)	Ref	Ref	Ref
Male	32/41 (78.0)	2.72 (1.11-6.68)	3.10 (1.10-8.72)	3.26 (1.05-10.07)
Age				
< 50	27/37 (73.0)	Ref	Ref	Ref
≥ 50	39/64 (60.9)	0.58 (0.24-1.40)	0.37 (0.13-1.10)	0.36 (0.11-1.15)
Education				
< High School	22/35 (62.9)	Ref	Ref	Ref
≥ High School/GED	42/64 (65.6)	1.13 (0.48-2.66)	1.20 (0.40-3.61)	1.20 (0.38-3.75)
Water Source				
Regulated (piped, bottled)	43/75 (57.3)	Ref	Ref	Ref
Mix	7/8 (87.5)	5.21 (0.61-44.48)	5.97 (0.64-55.36)	6.38 (0.60-67.70)
Unregulated (spring, well)	16/18 (88.9)	5.95 (1.28-27.76)	8.61(1.45-51.05)	9.32 (1.35-64.51))
Clinical				
Ulcers (history)	2/4 (50.0)	0.53 (0.07-3.83)	0.29 (0.03-3.03)	0.28 (0.02-3.23)
Gallstone (history)	14/24 (58.3)	0.67 (0.26-1.73)	1.44 (0.47-4.38)	1.45 (0.46-4.61)

Abbreviations: UBT, Urea Breath Test; OR, Odds Ratio; CI, Confidence Interval
[a]Model 1: Logistic Regression
[b]Model 2: Mixed Effects Logistic Regression with household as random effect



Community Partnership

This project is a partnership with multiple universities and Navajo agencies. This partnership included the sage advice and hard work of the Navajo CHR program who became part of the interview teams, the Navajo students from NAU and UA who drove hundreds of miles to 'ground truth' addresses and were part of the team. We also thank Al Yazzie (for working and advice on protocols and recruitment video), Alfreda Butler and Dr. Greg Jarrin at Winslow Indian Health Center in running the UBTs and seeing participants who tested positive.

DISCUSSION

- Prevalence of *H. pylori* is high in these Navajo communities. 65% positive with >72% of households at least 1person with infection
- Use of household water that was not regulated was strongly associated with active infection.
- Only 24% had ever heard of *H. pylori* and 13% were tested.
- Further work is needed to determine if there is geographic variation and what *H. pylori* substrains are involved for this population.
- Need to focus on developing prevention strategies to reduce *H. pylori* infection and target earlier detection.

"*FUNDING: Research reported in this publication was supported by the National Cancer Institute of the National Institutes of Health under the awards for the Partnership of Native American Cancer Prevention U54CA143924 (UACC) and U54CA143925 (NAU).*