

Predictors of *H. pylori* infection in a safety-net hospital in Arizona*

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ABSTRACT

Objective: The purpose of this study was to determine the risk factors associated with having *H. pylori* infection as proven by endoscopic biopsy at Maricopa Medical Center (MMC), a safety-net hospital in Phoenix, Arizona which serves primarily patients with limited financial and insurance resources. **Methods:** A total of 1116 biopsies were identified in a Department of Pathology database searched from November 2004 to March 2013. To be included, the subjects had to have an endoscopy with gastric biopsy. After the inclusion criteria were applied, 282 control subjects without histological evidence of *H. pylori* infection and 256 cases with histological evidence of *H. pylori* infection were identified. Patient charts were reviewed to extract information on variables collected for this study. **Results:** The mean age of cases and controls was 50.5 and 52.3 years respectively. The BMI of the cases and controls was 28.1 and 28.0 respectively. The mean number of upper endoscopic exams performed was 1.3 in cases and 1.4 in controls respectively. Potential predictors examined were gender, history of drug abuse, history of alcohol abuse, chronic pain medication use, smoking, employment status, outpatient vs. inpatient upper endoscopy exam, language spoken (English, Spanish, or bilingual), race/ethnicity, type of insurance, heart burn, dysphagia, abdominal pain, gastroduodenal ulcers, intestinal metaplasia, and having vs. not having a primary care physician. Based on univariate analyses, having a gastroduodenal ulcer, having a history of abdominal pain, Hispanic race, government insurance status, self-pay insurance status, and speaking Spanish only were found to be significantly related to having *H. pylori* infection. These variables were next entered into a multivariate analysis. The multivariate analysis

revealed that gastroduodenal ulcer, abdominal pain, Hispanic race and self-pay insurance status remained significant predictors of *H. pylori* infection. For the last 119 subjects, information regarding the country of their birth was available. These 119 subjects were separately analyzed. Country of birth, age, sex, Hispanic race, self-pay insurance status, Spanish speaker, and having government insurance were included in a multivariate analysis. Twenty seven percent of patients without *H. pylori* were born in the US, compared to fifty eight percent *H. pylori* positive patients who were born outside of the US. **Conclusion:** Hispanics are at high risk for *H. pylori* infection. In a multivariate model, patients with *H. pylori* were found to have a higher risk of ulcers, Hispanic race, abdominal pain and self-insurance status. When self-insurance and Hispanic race were included in another analysis with place of birth, only birth outside US remained significant.

Keywords: *H. pylori*; Insurance; Foreign Born

1. INTRODUCTION

Despite the decreasing prevalence of *H. pylori* within the indigenous United States population [1], migration from Mexico, particularly in Texas and California [2], has resulted in a higher burden of *H. pylori* infection. Data from El Paso, Texas, and Ciudad Juarez, Mexico utilizing stool antigen test for *H. pylori* among asymptomatic patients revealed a prevalence 38.2% of *H. pylori* [3]. In the San Francisco Bay area, the prevalence of *H. pylori* in immigrants, first degree and second generation US-born Hispanics were reported at 31.4%, 9.1% and 3.1% respectively [4]. Recently, 37.9% prevalence of *H. pylori* infection based on gastric biopsies was reported from northwestern Ontario [5]. The Canadian Helicobacter Study group has recommended focusing on treating Canadians

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with the highest prevalence of *H. pylori* infection [6].

Based on 2010 US census data, 26.9% of the population in Maricopa County Arizona comprised individuals of Hispanic or Latino origin, third after Texas and California, where 37.6% of the population is Hispanic [2]. We did not find any data on the characteristics of patients with *H. pylori* infection in Arizona which shares approximately 370 miles of porous border with Mexico. The purpose of this study was to determine the predictors of *H. pylori* infection in patients seen at a safety-net hospital located in Maricopa County, Phoenix, Arizona.

2. MATERIALS AND METHODS

Maricopa Medical Center (MMC) is located in Phoenix. The hospital is supported by the government to provide care to individuals who are either on Medicaid (government support) or are uninsured. Less than 5% of patients with commercial insurance are also seen in this hospital. The hospital is staffed by full-time employed gastroenterologists who see patients in the clinics as well as when they are admitted to the hospital. Typically patients admitted to the hospital undergo upper endoscopy examinations (EGD) for GI bleeding or unexplained upper abdominal pain, while outpatients undergo EGDs for dyspepsia, abdominal pain, occult GI bleeding or screening for varices.

We identified 1116 biopsies obtained during EGD in the department of pathology database from November 2004 to March 2013. Patients having only esophageal or/and duodenal biopsies were excluded, and only patients with EGD and gastric biopsies with or without any other biopsies were included. A total of 256 patients were identified to have histological evidence of *H. pylori* in-

fection. Another 282 patients without histological evidence of *H. pylori* were selected as controls. Gastric biopsies were read by four pathologists at MMC. Modified Giemsa stain was used for confirmation of *H. pylori* infection. All endoscopists obtained at least two biopsies from the gastric antrum.

Data were retrospectively collected on age, gender, sex, ethnicity, BMI, history of alcohol or drug abuse, narcotic prescription for chronic pain, dysphagia, heart burn, abdominal pain, gastroduodenal ulcer on EGD, patients having a follow up with a physician, EGD performed on in patients or out patients, presence or absence of intestinal metaplasia on gastric biopsies, having government insurance, self-pay status, language spoken (Spanish, English, or bilingual) retired status, employed, and number of EGDs performed. The data were obtained from a computerized database. Self-reported information was collected on drug or alcohol abuse, ethnicity, languages spoken, and employment status. A research assistant went through each electronic medical chart to obtain relevant data. For the last 119 patients seen from September 2012 to March 2013, information regarding country of birth was prospectively identified besides other information collected on all patients. The information available was analyzed for all subjects and separately analyzed also for subjects with information available on the country of birth (**Tables 1-5**).

The data were analyzed using SPSS version 20. Univariate as well as multivariate analyses were conducted to identify significant predictors of positive *H. pylori* infection. For insurance status, language status, and employment status, dummy variables were created with commercial insurance, English only, and employed used as the reference variables, respectively.

Table 1. Univariate analyses—dichotomous variables (general characteristics).

Characteristic	Percentage with this characteristic		<i>p</i> value*
	Controls	Cases	
Male	48% (135/282)	49% (125/256)	0.821
African-American	13% (33/257)	10% (22/228)	0.336
Hispanic	48% (123/257)	72% (164/228)	<0.0005
Spanish-Speaking	15% (41/279)	31% (75/245)	<0.0005
Bilingual	7% (19/279)	7% (17/245)	1.000
Unemployed	68% (191/282)	70% (179/256)	0.714
Retired	19% (53/282)	16% (40/256)	0.336
Government Insurance	86% (234/273)	72% (164/228)	<0.0005
Self-Pay	5% (13/273)	23% (54/236)	<0.0005

*Continuity-corrected chi-square test with 1 degree of freedom.

Table 2. (a) Univariate analyses—dichotomous variables (clinical characteristics); (b) Univariate analyses—continuous variables.

(a)			
Characteristic	Percentage with this characteristic		<i>p</i> value*
	Controls	Cases	
Has Primary Care Provider	78% (159/204)	74% (150/204)	0.352
Inpatient	31% (64/205)	25% (52/210)	0.143
Hx of Alcohol Abuse	37% (37/273)	38% (93/245)	0.900
Smoker	48% (131/273)	40% (98/245)	0.098
Chronic Pain Meds	34% (93/276)	28% (69/247)	0.157
Dysphagia	13% (36/279)	11% (27/253)	0.619
Abdominal Pain	46% (128/279)	72% (181/252)	<0.0005
Heart Burn	37% (102/278)	45% (113/253)	0.060
Intestinal Metaplasia	11% (30/278)	9% (22/249)	0.562
Gastric Duodenal Ulcer	2% (5/252)	14% (34/249)	<0.0005

(b)			
Characteristic	Means		<i>p</i> value**
	Controls (N)	Cases (N)	
Age	52.3 (282)	50.5 (256)	0.516
Number of Endoscopies	1.4 (282)	1.3 (255)	0.207
BMI	28.0 (258)	28.1 (239)	0.959

*Continuity-corrected chi-square test with 1 degree of freedom; **Independent groups t-test.

Table 3. Multivariate logistic regression analysis.

	<i>p</i> value	Odds ratio	95% CI for odds ratio	
			Lower	Upper
Gastric Duodenal Ulcer	<0.0005	8.140	3.100	21.372
Abdominal Pain	<0.0005	3.377	2.143	5.322
Hispanic	0.001	2.343	1.399	3.925
Government Insurance	0.384	1.479	0.613	3.565
Self-Pay	0.002	6.236	2.001	19.433
Spanish-Speaker	0.709	0.888	0.475	1.660

All predictors with a *p* value of 0.05 or less were entered into a logistic regression model. A total of 409 cases were analyzed. Hosmer-Lemeshow test: *p* = 0.911; Nagelkerke R-squared = 0.292.

3. RESULTS

The univariate analyses revealed that Hispanic race, speaking Spanish only, reporting abdominal pain, having either a duodenal or gastric ulcer, having government insurance, and self-pay status were significantly related to a positive finding for *H. pylori*. The multivariate analysis revealed that abdominal pain, presence of gastroduodenal ulcer, self-pay status and Hispanic race remained significant when the impact of all of the predictors together was assessed. For the last 119 subjects,

complete data on age, gender, Hispanic race, self-pay status, having government insurance, speaking Spanish only and foreign born status were available on 103 subjects. Sub-analysis on this data in a multivariate regression model showed that foreign born status remained significant **Table 5**.

4. DISCUSSION

The prevalence of *H. pylori* has been reported to be decreasing in industrialized nations such as the US be-

Table 4. Analysis of US born vs. foreign born variable (N = 118).

Group	
Control	Case
Percentage foreign born	Percentage foreign born
27% (20/75)	58% (24/43)

Table 5. Gender, age, hispanicity, self-pay, government insurance, Spanish speaker, and foreign born vs. US born were entered into a logistic regression model. A total of 103 cases were available for this analysis.

	Sig.	Exp (B)	95% CI. for EXP (B)	
			Lower	Upper
Age	0.374	0.985	0.952	1.019
Male_Gender	0.300	0.610	0.240	1.554
Hispanic	0.365	1.686	0.544	5.225
Selfpay	0.304	4.255	0.269	67.289
Govt	0.819	1.147	0.356	3.690
Spa	0.904	1.085	0.290	4.056
Foreign Born	0.008	4.513	1.481	13.757

Foreign Born vs. US Born remained significant, even after adjustment for the other variables. Hosmer-Lemeshow test: $p = 0.585$. Nagelkerke R-squared = 0.253.

cause of better hygiene, a higher standard of living, and use of antibiotics [7]. The Data reported in this study show that patients undergoing endoscopy at a safety net hospital who have a gastric duodenal ulcer are more than eight times more likely to be *H. pylori* positive than those who do not have an ulcer; and patients undergoing endoscopy who report abdominal pain are more than three times more likely to be *H. pylori* positive compared to those who do not report abdominal pain.

Results of this data also showed significantly higher odds of *H. pylori* positivity among patients who spoke Spanish, were Hispanic in origin and had no insurance (Table 3). On a separate analysis where place of birth (foreign born versus US born) was included in addition to race, language spoken and uninsured status, only place of birth remained significant (Table 5). Taken together, these data reveal *H. pylori* is more common in our hospital among those Hispanics who are born in Mexico. Nonetheless, many patients are infected with *H. pylori* who are not migrants from a foreign country and the source of *H. pylori* within that sub-set is not clear. It is possible that within the family members of *H. pylori* infected individuals, there is clustering of *H. pylori* infection [4].

Lower socioeconomic status has been consistently shown to be associated with *H. pylori* infection [8]. Exposure to vomitus or feces or residence in an overcrowded household is likely the cause of spread of *H. pylori* infection [9]. Approximately 2 million people of

Hispanic or Latino originally live in Arizona; of them 524,480 people were born in Latina America [10,11]. The percentage of Hispanics without health coverage has been reported to be 30.1%; higher than the overall rate reported as 15.7%. The rates of non-insurance for White non-Hispanics, Blacks and Asians have been reported to be 11.1%, 19.5% and 16.8% respectively [12]. Lack of insurance is also a surrogate marker of poverty and the non-coverage rates range from 25.4% in households with income less than \$25,000 to 7.8% when household income was \$75,000 or more [13]. This information suggests that not having insurance and Hispanicity are both associated with poverty and might be related to factors that predispose such individuals to *H. pylori* infection. Since data were collected from a safety net hospital, many undocumented subjects were included in our analyses although exact information on illegal individuals was not available. Nonetheless, non-citizens (legal and undocumented) are about three times more likely to be uninsured than citizens [14].

Intestinal metaplasia, alcohol/drug abuse and use of narcotics did not have any predictive value for *H. pylori* infection in our database. Intestinal metaplasia, atrophic gastritis and gastric cancer have been widely reported to be associated with *H. pylori* infection. 2.9% percent of patients with *H. pylori* infection can develop gastric cancer [15]. Intestinal metaplasia associated with *H. pylori* can be seen in gastric body as well as antrum. In our study, two biopsies were obtained on each patient; how-

ever, they were uniformly obtained from antrum and gastric body. Because of the retrospective nature of our study and lack of follow up endoscopic biopsies, we did not see any difference in prevalence of *H. pylori* in cases and controls in reported subjects of this study [16].

Conflicting data have been reported regarding association of *H. pylori* and alcohol consumption. Negative effect on *H. pylori* has been reported with moderate alcohol consumption [17]. However, among patients with functional dyspepsia, *H. pylori* has been shown to be associated with alcohol consumption [18]. Data reported in this database did not show any difference in alcohol use between patients with and without *H. pylori*, although specific amount of alcohol consumption is not available. Similarly, data regarding *H. pylori* and smoking are mixed. One study shows no significant relationship between *H. pylori* serology and smoking [19], while the other one reports a higher prevalence of *H. pylori* in smokers compared to non-smoker [20]. Our data did not show any relationship between smoking and *H. pylori* (**Table 2(a)**).

Findings reported in this study are important. First, data reported about predictors of *H. pylori* have never been reported from Arizona which is bordering Mexico and has one of the highest numbers of Hispanic population who have either emigrated from Mexico or born in US; several Hispanics live undocumented in Arizona and seek medical care at our safety net hospital. Second, this study shows that *H. pylori* remains a significant cause of peptic ulcer disease that requires hospitalization straining an already over stretched health care system. Finally and most importantly, the data reported herein identify a sub-group of patients including those who are uninsured or born outside US, who should be properly screened with either *H. pylori* stool antigen test or endoscopy, depending on an individual's circumstances and treating them accordingly with appropriate medications, particularly because *H. pylori* besides being a significant cause of peptic ulcer disease has also been classified as a class 1 carcinogen by WHO [6].

REFERENCES

- [1] Everhart, J.E., Kruszon-Moran, D., Perez-Perez, G.I., Tralka, T.S. and McQuillan, G. (2000) Seroprevalence and ethnic differences in *Helicobacter pylori* infection among adults in the United States. *The Journal of Infectious Diseases*, **181**, 1359-1363. doi:10.1086/315384
- [2] US Census Bureau (2012) Resident population by hispanic origin and state: 2010. <http://www.census.gov/compendia/statab/2012/tables/12s0018.pdf>
- [3] Cardenas, V.M., Mena, K.D., Ortiz, M., *et al.* (2010) Hyperendemic *H. pylori* and tapeworm infections in a U.S.-Mexico border population. *Public Health Reports*, **125**, 441-447.
- [4] Tsai, C.J., Perry, S., Sanchez, L. and Parsonnet, J. (2005) *Helicobacter pylori* infection in different generations of Hispanics in the San Francisco Bay Area. *American Journal of Epidemiology*, **162**, 351-357. doi:10.1093/aje/kwi207
- [5] Sethi, A., Chaudhuri, M., Kelly, L. and Hopman, W. (2013) Prevalence of *Helicobacter pylori* in a first nations population in northwestern Ontario. *Canadian Family Physician*, **59**, e182-e187.
- [6] Jones, N., Chiba, N., Fallone, C., *et al.* (2012) *Helicobacter pylori* in first nations and recent immigrant populations in Canada. *Canadian Journal of Gastroenterology*, **26**, 97-103.
- [7] Grad, Y.H., Lipsitch, M. and Aiello, A.E. (2012) Secular trends in *Helicobacter pylori* seroprevalence in adults in the United States: Evidence for sustained race/ethnic disparities. *American Journal of Epidemiology*, **175**, 54-59. doi:10.1093/aje/kwr288
- [8] Leclerc, H. (2006) Epidemiological aspects of *Helicobacter pylori* infection. *Bulletin de l'Academie Nationale de Medecine*, **190**, 949-962.
- [9] Brown, L.M. (2000) *Helicobacter pylori*: Epidemiology and routes of transmission. *Epidemiologic Reviews*, **22**, 283-297. doi:10.1093/oxfordjournals.epirev.a018040
- [10] Pew Hispanic Center (2010) Statistical portrait of the foreign-born population in the United States. <http://www.pewhispanic.org/2012/02/21/statistical-portrait-of-the-foreign-born-population-in-the-united-states-2010/#14>
- [11] US Census Bureau (2010) Hispanics or latino population for the United States, region, states, and for Puerto Rico. <http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf>
- [12] DeNavas-Walt, C., Proctor, B.D. and Smith, J.C. (2012) Income, poverty, and health insurance coverage in the United States: 2011. US Census Bureau, Current Population Reports, P60-243, US Government Printing Office, Washington DC.
- [13] US Census Bureau (2011) Uninsured rate by real household income: 1999 to 2011. <http://www.census.gov/prod/2012pubs/p60-243.pdf>
- [14] (2010) Statistical portrait of the foreign-born population in the United States Pew Hispanic Center. <http://www.pewhispanic.org/2012/02/21/statistical-portrait-of-the-foreign-born-population-in-the-united-states-2010/#40>
- [15] Uemura, N., Okamoto, S., Yamamoto, S., *et al.* (2001) *Helicobacter pylori* infection and the development of gastric cancer. *The New England Journal of Medicine*, **345**, 784-789. doi:10.1056/NEJMoa001999
- [16] Kuipers, E.J., Uytterlinde, A.M., Pena, A.S., *et al.* (1995) Long-term sequelae of *Helicobacter pylori* gastritis. *Lancet*, **345**, 1525-1528. doi:10.1016/S0140-6736(95)91084-0
- [17] Brenner, H., Bode, G., Adler, G., Hoffmeister, A., Koenig, W. and Rothenbacher, D. (2001) Alcohol as a gastric disinfectant? The complex relationship between alcohol

- consumption and current *Helicobacter pylori* infection. *Epidemiology*, **12**, 209-214.
[doi:10.1097/00001648-200103000-00013](https://doi.org/10.1097/00001648-200103000-00013)
- [18] Zhang, L., Eslick, G.D., Xia, H.H., Wu, C., Phung, N. and Talley, N.J. (2010) Relationship between alcohol consumption and active *Helicobacter pylori* infection. *Alcohol and Alcoholism*, **45**, 89-94. [doi:10.1093/alcalc/agg068](https://doi.org/10.1093/alcalc/agg068)
- [19] Hishida, A., Matsuo, K., Goto, Y., *et al.* (2010) Smoking behavior and risk of *Helicobacter pylori* infection, gastric atrophy and gastric cancer in Japanese. *Asian Pacific Journal of Cancer Prevention*, **11**, 669-673.
- [20] Konturek, S.J., Bielanski, W., Plonka, M., *et al.* (2003) *Helicobacter pylori*, non-steroidal anti-inflammatory drugs and smoking in risk pattern of gastroduodenal ulcers. *Scandinavian Journal of Gastroenterology*, **38**, 923-930. [doi:10.1080/00365520310004696](https://doi.org/10.1080/00365520310004696)