

A retrospective study of potential influence factors on *Helicobacter pylori* infection treatment

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Abstract

Background

The high prevalence of *Helicobacter pylori* (*H. pylori*) infection has been associated with overcrowding, poor housing, poor sanitation and unclean water supplies in developing countries.

Methods

We assessed records of symptomatic patients attending Southwest Hospital in 2017, collected patients' information such as age, gender, education levels, income level, number of family members, frequency of hand washing after defecation, past history of gastropathy and so on. Chi square analysis, t-test and Odds Ratio (OR) were used to evaluate the effect of potential factors on treatment effect.

Results

Age, gender, number of family members, follow-up time, type of toilet, water source and past history of gastropathy seemed to be irrelevant to *H. pylori* infection control. Higher education level was benefit for patients (OR 0.315, 95% CI 0.134-0.741, $P=0.008$). Less frequency of hands washing after defecation was harmful factors for *H. pylori*-positive patients' treatment (OR=3.438, 95% CI 1.679-7.039, $P=0.001$). Better income status was a protective factor only in Univariate analysis (OR=0.396 95% CI 0.197-0.795, $P=0.01$).

Conclusion

A better education background and strict habits of hands washing were both helpful for *H. pylori*-positive patients' treatment.

Background

Helicobacter pylori (*H. pylori*) is a Gram-negative and micro-aerophilic bacteria that colonize in human stomach, and *H. pylori* infection affects almost half of the world's population(1). As the major risk factor of peptic ulcer diseases, *H. pylori* was also classified as a grade I carcinogen by World Health Organization (2). In fact, its infection lead to duodenal ulcer disease, gastric ulcer disease, gastric adenocarcinoma and gastric lymphoma(3). In addition to digestive diseases, *H. pylori* infection was also associated with cardiovascular, neurologic, hematologic, head and neck, urogynecologic diseases, as well as diabetes mellitus and metabolic syndrome in the past several years (4, 5).

The high prevalence of *H. pylori* infection in developing countries has been associated with overcrowding, poor housing, poor sanitation and unclean water supplies in some researches(6). Shiferaw et al(7) assessed the symptomatic patients attending at a private clinic from August 2017 until May 2018 in Addis Ababa city, Ethiopia, and found the prevalence of *H. pylori* infection was 36.8%, which was related to low income and low education levels. Wang et al(8) found in a community in Hebei Province of China, more than half of the population was infected with *H. pylori*, the socio-demographic profiles, socio-

economic factors and lifestyle are potential factors affected on the prevention of diseases associated with *H. pylori* infection. Takunori et al(9) even found that *H. pylori* infection is more strongly related to living with one's grandparents than living in a hygienic environment.

Apart from *H. pylori* resistance, few researches focused on the potential factors affected on *H. pylori* infection treatment(10, 11). Therefore, we conducted a retrospective study on *H. pylori* infected patients in Southwest Hospital, and collected their income, education, living conditions to find out their role in *H. pylori* infection treatment.

Method

Study design, period and area

We assessed records of symptomatic patients attending Southwest Hospital between January 1, 2017 and December 31, 2017 with their magnitude of *H. pylori*. All patients were treated with standard first-line triple therapy (Proton-pump inhibitor twice daily, 500 mg clarithromycin twice daily, and 1 g amoxicillin twice daily for 7 days). Patients followed up within one year were included in the current study, magnitude of *H. pylori* was determined again at their first follow-up to evaluate the treatment effect. Our study was submitted to and approved by Southwest Hospital Ethics Committee.

Information collection

Socio-economic factors and lifestyles information were collected such as age, gender, education levels, income level, number of family members, frequency of hand washing after defecation, past history of gastropathy and so on. Patients' education levels were divided into bachelor degree or above, secondary school or below. Income level were evaluated by family monthly income, and divided into two levels as more than 6,000 RMB and less than 6,000 RMB. Frequency of hand washing after defecation were recorded as every time and occasionally or never.

Determine the magnitude of H. pylori

H. pylori infection was evaluated by the ¹³C urea breath test (¹³C-UBT) in the morning after fasting for at least 8 h. Breath samples were collected from each subject at baseline and 30 min after drinking 75 mg of ¹³C-urea in 70 mL room temperature water. The test was performed with a ¹³C-breath test instrument (Fischer Analysen Instrumente GmbH, Leipzig, Germany), and results were expressed as a surplus of isotopic ratio over baseline (delta over baseline [DOB]). A DOB value of > 4 ‰ was considered positive, according to instructions from test manufacturer.

Statistical analysis

Statistical analyses were performed using Statistical Package for SPSS (Windows version 20.0). Chi square analysis, t-test and Odds Ratio (OR) were used to evaluate the effect of potential factors on treatment effect. Two-sided P value < 0.05 was considered as statistically significant.

Result

General information

According to inclusion criteria, 149 patients, 84 females and 65 males were included in our analysis, the mean age was 45.2 ± 13.4 years, with a range of 9 to 70 years. As to income level, 37 patients were more than 6,000 RMB, and 112 were less than 6,000 RMB. Forty-six patients lived with one family member, 50 with two members, 35 with three members and 17 lived alone. Forty-one patients were bachelor degree or above, and the rest 108 patients had secondary school degrees or below. Two patients used Pit toilet, and the rest patients used flush toilet at home. Seven patients used purified water as drinking water and the other 142 used tap waters. Washing hands after defecation was essential to 67 patients, and 82 patients occasionally or never washed hands after defecation. Ninety-eight patients had a past history of gastropathy and 51 had not.

The average follow-up time was 110 days (20 days to 344 days), 85 patients were *H. pylori*-negative at their first follow-up and 64 were still *H. pylori*-positive.

Potential factors on treatment effect

As shown in table 1, gender (female vs male, OR 1.13, 95%CI 0.587-2.168, $P=0.72$), age (40 years old as cut-off value, OR 1.271, 95%CI 0.654-2.470, $P=0.48$ and 50 years old as cut-off value, OR 1.023, 95%CI 0.529-1.979, $P=0.95$), number of family member (3 family members as cut-off value, OR 1.13, 95%CI 0.587-2.168, $P=0.72$), type of toilet (flush toilet vs pit toilet, OR 1.771, 95%CI 1.537-2.041, $P=0.51$), water source (tap water vs purified water, OR 0.561, 95%CI 0.097-2.750, $P=0.70$) and past history of gastropathy (no vs yes, OR 0.876, 95%CI 0.443-1.732, $P=0.70$) might not affect the treatment significantly. Follow-up time seemed to be irrelevant with treatment effect (t-test, $P=0.336$).

Patients with less than 3000 RMB monthly income were more likely to show *H. pylori*-positive at their first follow-up, with OR 2.163 (95%CI 1.101-4.249) and $P=0.02$. Bachelor degree or above was a protective factor that might help patients to get a better treatment effect, OR 0.396 (95%CI 0.197-0.795) and $P=0.01$. Washing hands after toilet was also a protect factor that might do good for patients, for the OR for patients not washing hands every time was 3.176 (95%CI 1.616-6.242) and $P=0.00$ (table 2).

Multivariate analysis

Patients' income level, education level and hands washing habit after defecation were further analyzed by Multivariate regression analysis. As shown in table 3, income level was not a significant factor that affect treatment effect, for the OR was 1.25 (95%CI 0.541-2.885) with $P=0.601$. While higher education level was benefit for patients, and the ORs were 0.315 (95%CI 0.134-0.741), $P=0.008$. Less frequency of hands washing after defecation was harmful factors for *H. pylori*-positive patients' treatment, OR=3.438 (95%CI 1.679-7.039), and $P=0.001$.

Discussion

H. pylori is the cause of acute and chronic gastritis and highly associated to gastric cancer and peptic ulcer(12). The prevalence of H. pylori varies across the globe, which partly due to socioeconomic difference. Although H. pylori infection transmission route is not clearly known, fecal contaminated water and food, fecal-oral contact are considered to be possible sources of infection, according to some evidences(13, 14). Helicobacter pylori infection is apparent in resource limited countries than in developed countries and the distribution varies between different communities and geographical locations(15).

In the current research, H. pylori-positive patients were treated with standard first-line triple therapy (Proton-pump inhibitor twice daily, 500 mg clarithromycin twice daily, and 1 g amoxicillin twice daily for 7 days). H. pylori infection was evaluated again at the first follow-up, and 43.0% patients were still H. pylori-positive. Related information such as age, gender, education levels, income level, number of family members, frequency of hand washing after defecation and past history of gastropathy were collected to assess their affection on infection treatment.

According to our analysis, monthly income less than 3000 MRB was an unfavorable factor for H. pylori related treatment, which implied that economic conditions were nonnegligible factors to H. pylori infection treatment and control. Meanwhile, better education background, hands washing habits, always associated with better incomes, were both beneficial factors for H. pylori infection treatment. These conclusions were similar to some previous researches(2, 16). After multivariate regression analysis, income level was not statistically significant, while better education background, hands washing habits were still recognizable.

Age, gender, number of family members, follow-up time, type of toilet, water source and past history of gastropathy seemed to be irrelevant with H. pylori infection control. These results, especially type of toilet and water source were not a statistically significant factor on H. pylori infection control, were not consistent with some conclusions before(2), which should be interpreted with caution. Only 2 patients used pit toilet at home, and 7 patients used purified water as drinking water source, therefore, inadequate sample size might lead to a biased result.

Conclusion

The current research collected patients' information and analyzed the potential effect of some factors on H. pylori infection control. A better education background and strict hands washing habits were both helpful for H. pylori-positive patients' treatment.

Abbreviations

H. pylori, Helicobacter pylori

OR, Odds Ratio

RMB, Renminbi

¹³C-UBT, ¹³C urea breath test

DOB, delta over baseline

Declarations

Ethics and Consent to Participate

Our study was submitted to and approved by Southwest Hospital Ethics Committee.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no conflict of interest.

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Authors' contributions

XQ and LX analyzed and interpreted the patient data. LX was a major contributor in writing the manuscript. DH and YY designed the research, and all authors read and approved the final manuscript.

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Tables

Table 1 The main information of collected patients.

Variables		Frequency	Percent (%)	Positive	negative
Sex	male	65	43.62	36	29
	female	84	56.38	49	35
Age category in years	<20	2	1.34	1	2
	20-30	21	14.09	13	8
	31-40	34	22.82	17	17
	41-50	30	20.13	19	11
	51-60	41	27.52	19	22
	61-70	20	13.42	16	4
	Income	>6000	37	24.83	17
	3000-6000	53	35.57	24	29
	<3000	59	39.60	38	21
Family number	1	17	11.41	6	11
	2	46	30.87	31	15
	3	50	33.56	29	21
	4	35	23.49	18	17
Educational status	primary	41	27.52	27	14
	middle school	60	40.27	37	21
	bachelor degree or above	48	32.21	21	29
Type of toilet	Pit toilet	2	1.34	2	0
	Flush toilet	147	98.66	83	64
Water source	Purified water	7	4.70	5	2
	tap water	142	95.30	80	62
Hand wash after toilet	every time	67	44.97	28	39
	occasionally or never	82	55.03	57	25
past history of gastropathy	yes	98	65.77	57	41
	no	51	34.23	28	23

Table 2 The Univariate analysis of potential factors on H. pylori treatment

Variables		Frequency	Percent (%)	Positive	negative	OR[95%CI]	P
Sex	male	65	43.62	36	29	1.00	
	female	84	56.38	49	35	1.13(0.587-2.168)	0.72
Age category in years	<40	58	38.93	31	27	1.00	
	41-70	91	61.07	54	37	1.271(0.654-2.470)	0.48
	<50	88	59.06	50	38	1.00	
	51-70	61	40.94	35	26	1.023(0.529-1.979)	0.95
Income	>3000	90	60.40	41	49	1.00	
	<3000	59	39.60	38	21	2.163(1.101-4.249)	0.02
	>6000	37	24.83	17	20	1.00	
	<6000	112	75.17	62	50	1.459(0.692-3.077)	0.32
Family number	<2	63	42.28	37	26	1.00	
	>=3	85	57.05	47	38	0.869(0.450-1.680)	0.68
Educational status	second school or below	99	66.44	64	35	1.00	
	bachelor degree or above	50	33.56	21	29	0.396(0.197-0.795)	0.01
Type of toilet	Pit toilet	2	1.34	2	0	1.00	
	Flush toilet	147	98.66	83	64	1.771(1.537-2.041)	0.51
Water source	Purified water	7	4.70	5	2	1.00	
	tap water	142	95.30	80	62	0.516(0.097-2.750)	0.70
Hand wash after toilet	everytime	67	44.97	28	39	1.00	

	occasionally or never	82	55.03	57	25	3.176(1.616-6.242)	0.00
Past history of gastropathy	yes	98	65.77	57	41	1.00	
	no	51	34.23	28	23	0.876(0.443-1.732)	0.70

Table 3 The Multivariate regression analysis of potential factors on H. pylori treatment

Variables		Frequency	Percent (%)	Positive	negative	OR[95%CI]	P
Income	>3000	90	60.40	41	49		
	<3000	59	39.60	38	21	1.25(0.541-2.885)	0.601
Educational status	second school or below	99	66.44	64	35		
	bachelor degree or above	50	33.56	21	29	0.315(0.134-0.741)	0.008
Hand wash after toilet	everytime	67	44.97	28	39		
	occasionally or never	82	55.03	57	25	3.438(1.679-7.039)	0.001