Original Article

Prevalence of *Helicobacter pylori* Infection in Water Trash Collectors of Bangkok Metropolitan Administration

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Background: *Helicobacter pylori* (*H. pylori*) could transmit from person to person, and via consumption of contaminated food and water. Water trash collectors are usually in close contact with trash, raising the question whether they have a higher risk of *H. pylori* infection.

Objective: To assess the prevalence of *H. pylori* infection among water trash collectors and family members-of Bangkok Metropolitan Administration (BMA) and to evaluate the occupational and intrafamilial risk for *H. pylori* infection.

Materials and Methods: Through a cross-sectional study design, water-trash collectors of BMA and their family members were invited to be tested for *H. pylori* infection via urea breath test (^{14}C-UBT). All participants completed a questionnaire requesting information about socio-demographic data, employment data, personal hygiene, and presence of dyspeptic symptoms.

Results: One hundred forty-nine water trash collectors were enrolled. Mean age was 46.3 years and male accounted for 51%. The prevalence of *H. pylori* infection was 61.7% in trash collectors and 76% in their family members. For the trash collectors, an educational level below grade 12 (adjusted odds ratio [OR] 13.87, 95% CI 1.59 to 121.02), p = 0.017) and sharing food without a serving spoon (adjusted OR 4.28, 95% CI 1.26 to 14.48, p = 0.019) significantly increased the risk of *H. pylori* infection, while drinking filtered water protected against *H. pylori* infection (adjusted OR 0.36, 95% CI 0.13 to 0.99, p = 0.049). Work behaviors and family members were not associated with *H. pylori* infection.

Conclusion: Water trash collectors have a higher prevalence of *H. pylori* infection than among the general Thai population but our results could not demonstrate any occupational risk factors for *H. pylori* infection.

Keywords: Family, *Helicobacter pylori*, Occupation, Risk, Water trash collectors

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More than half of the world population is infected with *Helicobacter pylori* (*H. pylori*[1-3]. *H. pylori* infected persons have a 3 to 4 times greater risk of peptic ulcers and 3.8 times increased risk of gastric cancer[4]. The World Health Organization classified *H. pylori* as type 1 carcinogen[2].

Transmission of *H. pylori* mainly occurs from person-to-person early in life, through oral-oral, gastro-oral, and oral-fecal routes. Water-born transmission has also been suggested[5-9]. *H. pylori* has been isolated from feces[10], gastric secretions, vomitus, saliva, and dental plaque[11,12], therefore, environmental transmission via consumption of contaminated food and water is possible[13-16]. The prevalence of *H. pylori* infection varies among different regions, as high as 80% in developing countries and as low as 20% in Western countries[1,17]. The study from Ng, et al reported a 43% prevalence of *H. pylori* infection in South-East Asia, and the highest prevalence (76%) in Africa[1].

Studies in highly infected populations showed important risks such as intra-family infection, poor sanitary conditions, lack of access to a reliable source of clean water[18], and lower socioeconomic factors such as low income, and living in crowded homes[19]. In developing countries, the majority of transmissions is via contaminated food or water[20], and transmission events were more frequent in individuals living in the same house with infected individuals[21].

There have been few studies focused on occupational risk of *H. pylori*. Meta-analysis demonstrated an increased risk of *H. pylori* infection among gastroenterologists and their assistants, with a significant risk of 1.6 for doctors and 1.4 for assistants[22], and another study reported a risk in health care workers over a 5-year period[23]. A study of waste pickers in Mexico demonstrated a prevalence of *H. pylori* of 68% compared with 57% in an age-matched control group, and the prevalence increased in parallel to years worked[24]. However, other study could not demonstrate the occupational exposure risks for *H. pylori* infection among sewage workers in Belgium[25].

In Thailand, the reported rate of *H. pylori* infection ranges from 54 to 76%[26]. The Nationwide Study of *H. pylori*

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infection reported an overall prevalence of 46% which varies between different regions of the country, from 30% in Bangkok and 61% in the northeast region[27]. Due to the lack of data for occupations at risk of *H. pylori* infection in Thailand, we aimed to study the occupational risk for *H. pylori* infection among water trash collectors who are routinely exposed to garbage and dirty water. We postulated a high prevalence of *H. pylori* infection in water trash collectors due to the nature of their work as well as other risk factors, such as low socioeconomic status. The second objective was to identify associated factors that might influence the infection, such as poor hygiene and in-household transmission.

Materials and Methods

Sample size calculation

A previous study by Alvarado-Esquivel, et al[24] observed a prevalence of *H. pylori* infection in Mexican waste pickers of 67% with a maximum tolerated error determined by an investigator of 10%, alpha depends on a confidence level 95%, the number of participants was calculated to be at least 85 subjects.

Study design and study population

Using an observational cross-sectional study design, water trash collectors of the Bangkok Metropolitan Administration (BMA) across 6 working areas and their family members were invited to participate.

Water-trash collectors

Water-trash collectors were included if they, 1) have been working for at least 3 months; 2) aged 18 years and older. We excluded trash collectors who were: 1) taking proton pump inhibitors (PPIs) within 14 days or H2 blockers within 7 days prior to the test; 2) taking antibiotics or bismuth containing medications within 28 days prior to the test; 3) pregnant or breast feeding persons; 4) uncontrolled co-morbid disease.

Members of trash collector's households

The inclusion and exclusion criteria were similar to the trash collectors but with the additional criteria which included: 1) they were staying in the same house for at least 3 months; 2) spent the night in the same house for at least 5 days per week; 3) had meals together at least 5 times per week.

Questionnaire

All trash collectors completed a questionnaire No. 1 to 4, and family members completed No. 1 to 5. Information was collected on: 1) demographic data (sex, age, educational level, income, alcohol consumption, smoking); 2) employment data (duration, working behavior with habitual use of safety practices and protection, such as use of hand gloves and face masks); 3) personal habits/hygiene; 4) clinical data (underlying disease, medication, herb, presence of dyspeptic symptoms classified by Rome IV criteria[28], and 5) housing condition such as number of persons in the house, number of meals together, frequency of spending the night in the same house, and meals together. Data on personal hygiene, employment, and dyspeptic symptoms were collected based on self-reported exposure.

Diagnosis of H. pylori infection

We used urea breath test (^{14}C-UBT) for *H. pylori* diagnosis. The sensitivity and specificity of the test has previously reported, was 97% and 92%, respectively[29]. After fasting for 4 hours, all participants consumed urea capsule and underwent urea breath test (^{14}C, Shenzhen Zhonhe Headway Bio-Sci & Tech Co., Ltd., China), which were automatically reported as a positive or negative result.

Statistical analysis

Statistical analysis was performed using STATA/MP12. Continuous data were presented as mean and standard deviation (SD). Categorical data were reported as frequency (%), Chi-square test or Fisher's exact test were used to evaluate association between factors and *H. pylori* infection. All associations with *p*-values <0.10 were included in the full model of logistic regression. The odds ratio (OR) and 95% confidence interval (CI) were used to estimate the independent risk. A *p*-value <0.05 was considered statistically significant. This study was approved by the institute's ethics committee, Faculty of Medicine Vajira Hospital, Navamindradhiraj University. The purpose and procedures of the study were explained to all participants, and written informed consent was obtained from each participant.

Results

A total of 200 water-trash collectors underwent UBT, of which 51 were excluded because of miscommunication. Family members of all trash collectors (315 persons) were invited, but only 25 agreed to participate. The remaining of 149 trash collectors and 25 family members were included in the final analysis (Figure 1).

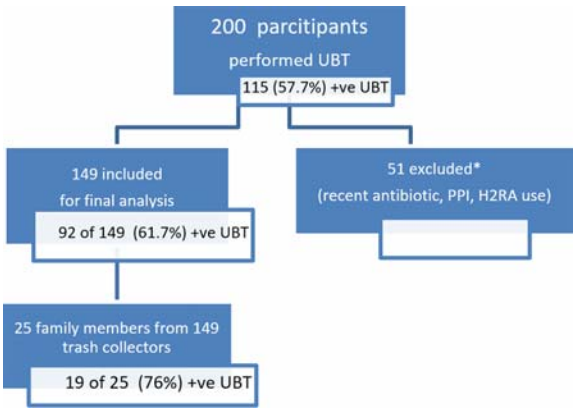

Figure 1. Flow diagram of participants and prevalence of *H. pylori* infection.

Demographic characteristics of participants

Of 149 water trash collectors, 72 (48.3%) were males with mean age of 46 years (range 21 to 60 years). Three age groups were defined: 30 years or younger (8.1%), 31 to 50 years (51.7%), and more than 50 years (40.3%). About one-thirds (35.6%) of trash collectors were born in Bangkok, with the majority living in single-family houses (59.7%). The majority of trash collectors (94%) had an educational level below grade 12. They had an average working duration of 15.6±8.73 years with a salary of 12,252±3524 baht a month (equivalent to 350 USD). For personal hygiene, 93% ate while working, only 62% washed their hands every time before eating, 53.4% always picked up food with their hands, and 18.8% never used serving spoons (Table 1).

Prevalence of H. pylori infection and associated factors

The prevalence of *H. pylori* infection was 61.7% in trash collectors and 76% among the members of trash collectors' households (Figure 1).

The risk factors of *H. pylori* infection were not related to gender, mean age, age group, birthplace, duration of living in BKK, salary and type of housing. Even though the infection rate was higher in older participants, there was no significant difference in age-specific *H. pylori* infection. By univariate analysis, factors that positively correlated with *H. pylori* infection were an educational level below or equal to grade 12 (65.7% vs. 11%, $p = 0.002$), and sharing food without serving spoon (82% vs. 53.5%, $p = 0.017$), while drinking filtered water showed a negative association to *H. pylori* infection (57.6% vs. 78.9%, $p = 0.008$). Smoking, alcohol consumption and other unhygienic behaviors, such as picking up food with hands or eating uncooked food, did not influence the prevalence (Table 2).

Table 1. Socio-demographic characteristics

Variables	Total participants (n = 149)
Age (years), mean (SD)	46 (9)
Age distribution, n (%)	
≤30 years	12 (8.1)
31 to 50 years	77 (51.7)
>50 years	60 (40.3)
Male, n (%)	77 (51.7)
Range of working duration, n (%)	
<10 years	43 (29)
10 to 20 years	67 (45)
>20 years	39 (26.2)
Educational level below grade 12, n (%)	140 (94)
Alcohol consumption, n (%)	45 (30.2)
Current smoking, n (%)	58 (38.9)
Income per month (baht), mean (SD)	12,252 (3,524)
Birth place, n (%)	
Bangkok	53 (35.6)
Urban	96 (64.4)
Duration in Bangkok (years), mean (SD)	30 (14.5)
Housing, n (%)	
Single house	89 (59.7)
Rented room	31 (20.8)
Others	29 (19.5)

Working area and working behaviors (occupational risks)

No specific working areas correlate to *H. pylori* prevalence (data not shown). The duration of work and working behaviors such as habitual use of hand gloves and facemask, did not significantly influence the prevalence of *H. pylori* infection. Although 93% of trash collectors ate while working, only 62.4% washed their hands before eating, and 32.2% brought drinking water from their home but these factors did not differ between infected and non-infected groups (Table 3).

Gastrointestinal symptoms

There were 42 trash collectors (28.2%) who had at least one underlying disease. Only 10% of participants had dyspeptic symptoms but the prevalence of *H. pylori* infection was not significantly different between symptomatic and asymptomatic participants (Table 4).

By using multiple logistic regression analysis for identification of the related factors for *H. pylori* infection, we found that education level below or equal to grade 12 (adjusted OR 13.87, 95% CI 1.59 to 121.02, $p = 0.017$), and sharing food without serving spoon (adjusted OR 4.28 (95% CI 1.26 to 14.48, $p = 0.019$) were risk factors for *H. pylori* infection, while drinking filtered water protected against infection (adjusted OR 0.36, 95% CI 0.13 to 0.99, $p = 0.049$) (Table 5).

H. pylori infection in members of water trash collectors' household

Only 25 of 319 invited household members participated, of which 13 (53%) were from the households of trash collectors with *H. pylori* infection. The prevalence of *H. pylori* infection was 76%, of which the majority were household members of *H. pylori* infected-trash collectors, but this did not reach significant difference (57.9% vs. 42.1%, $p = 0.370$). The relationships with families did not influence *H. pylori* prevalence (data not shown). Educational level and personal hygiene also showed no difference between infected and non-infected groups (data not shown).

Discussion

The present study demonstrated a high prevalence of *H. pylori* infection (61.7%) among water trash collectors of BMA and was higher than had been previously reported among the general Thai population (45%)[27], but this comparison may need to be confirmed. There was different methods for *H. pylori* diagnosis among studies. The present study used UBT, whereas the previous studies used gastric biopsy with Giemsa staining and immune-staining with anti-*H. pylori* antibody. However, the high prevalence in the present study is comparable to the 67.7% prevalence in trash pickers in Mexico[24].

Table 2. Demographic characteristics, personal hygiene and prevalence of *H. pylori* infection among 149 water trash keepers

Variables	Numbers	*H. pylori* infection, n (%)	*p*-value
Age			
≤30 years	12	7 (58)	0.768
31 to 50 years	77	46 (59)	0.671
≥50 years	60	39 (65)	0.607
Gender			
Male	77	45 (61)	0.868
Female	72	47 (62)	
Educational level			
≤ grade 12	140	91 (65.7)	0.002
> grade 12	9	1 (11)	
Birth place			
Bangkok	53	31 (58.5)	0.726
Urban	96	59 (61.5)	0.862
Housing			
House	118	70 (59.3)	0.864
Rented room	31	22 (71.1)	0.301
Alcohol consumption	45	29 (64.4)	0.716
Current smoking	58	36 (62)	1.000
Use serving spoon			
Always	43	23 (53.5)	0.198
Sometimes	78	46 (59)	0.503
Never	28	23 (82.1)	0.017
Pickup food with hands			
Always	80	45 (56.3)	0.238
Sometimes	69	46 (66.7)	0.311
Never	0	0	
Eat raw or uncooked food			
Always	129	76 (59)	0.086
Sometimes	20	16 (80)	0.086
Never	0	0	
Type of drinking water			
Bottled water	23	16 (69.6)	0.488
Filtered water	98	53 (54.1)	0.008
Tap water	2	2 (100)	0.524
Others*	26	21 (80.7)	0.552

* Consume various type of water (boiled or tap or bottle water), could not be evaluated

Water has been suggested as a source of *H. pylori* infection since 1991[30] and study by Nurgalieva, et al found that drinking river water was a high risk factor for *H. pylori* infection in Kazakhstan[16]. There are reports of a higher prevalence of *H. pylori* infection and occupational risk among gastroenterologists[22], dentists[23], trash collectors, and health care workers[31]. Water-trash collectors are routinely exposed to garbage, dirty water or other contaminated excreta, and frequently worked without habitual use of hygiene protection, yet their higher prevalence of *H. pylori* infection was not associated with occupational exposure or duration of working that shown in previous study[24], but was related to a low-educational status and poor hygienic practice (sharing food without using serving spoons), consistent with previous studies[14,18,19,32]. The reasons that the present study could not demonstrate occupational risk and the duration in trash collecting for acquiring *H. pylori* infection might be because the majority of participants had low socioeconomic status with poor hygienic practices and possible pre-existing *H. pylori* infection. In Thai table culture, food is shared together among the family members without serving spoons, so *H. pylori* could be from contaminated saliva in early life, as noted in previous studies where *H. pylori* could be detected in dental plaque and saliva[23,33].

Not all individuals with dyspeptic symptoms had *H. pylori* infection. In a study by Hooste, et al, they showed no correlation between gastrointestinal symptoms and *H. pylori* infection among Flemish municipal sewage workers[26]. This was consistent with the present study, even though participants with significant dyspeptic symptoms tend to have a higher rate of *H. pylori* but it was not statistical significant.

Drinking filtered-water appeared protective against *H. pylori* infection in the present study, but this did not correlate with previous studies[34,35]. A possible explanation may be that the reverse osmotic system and filter membrane

Table 3. Work characteristics and prevalence of *H. pylori* infection

Variables	Total number (%)	*H. pylori* infection, n (%)	*p*-value
Years of working			
<10	43 (28.8)	29 (67.4)	0.457
10 to 20	67 (45)	39 (58.2)	0.500
>20	39 (26.2)	24 (61.5)	1.000
Use hand gloves			
Always	62 (41.6)	42 (67.8)	0.234
Sometimes	68 (45.6)	41 (61.8)	0.866
Never	19 (12.8)	9 (47.4)	0.208
Use facemask			
Always	29 (19.5)	17 (58.6)	0.832
Sometimes	56 (37.5)	36 (64.3)	0.728
Never	64 (43)	39 (61)	0.867
Eating while working			
Always	139 (93.3)	84 (60.4)	0.319
Sometimes	10 (6.7)	8 (80)	0.319
Never	0	0	
Washing hands before eating			
Always	93 (62.4)	56 (60)	0.728
Sometimes	53 (35.6)	44 (83)	0.726
Never	3 (2)	2 (66.7)	1.000
Source of drinking water			
From home	48 (32.2)	28 (58.3)	0.591
From work place	101 (67.8)	64 (63.4)	0.721

Table 4. Dyspeptic symptoms and prevalence of *H. pylori* infection

Variables	Total (n = 149)	*H. pylori* infection, n (%)	*p*-value
Post prandial fullness			
None	133	81 (60.9)	0.599
<3 days/week	12	8 (66.6)	1.000
≥3 days/week	4	3 (75)	1.000
Early satiety			
None	134	84 (62.6)	0.578
<3 days/week	11	5 (45.4)	0.335
≥3 days/week	4	3 (75)	1.000
Epigastric pain			
None	141	86 (61)	0.711
<1 day/week	5	3 (60)	1.000
≥1 day/week	3	3 (100)	0.287

Table 5. Factors associated with *H. pylori* infection among water trash collectors

Variables	Adjusted OR (95% CI)	*p*-value
Education grade 12 or lower	13.87 (1.59 to 121.02)	0.017*
Use serving spoon		
Always	Reference	1
Sometimes	1.29 (0.58 to 2.85)	0.536
Never	4.28 (1.26 to 14.48)	0.019*
Drinking filtered water	0.36 (0.13 to 0.99)	0.049*

of commercial water purifiers currently in use in Thailand could remove all *H. pylori* (size 0.5 to 1 x 2.5 to 5 µm). The US Centers for Disease Control And Prevention (CDC) recommends using filters with reverse osmosis with an

absolute pore size of 1 µm or smaller to remove microbes 1 µm or greater in diameter such as Cryptosporidium and Giardia[36].

Family members play an important role in *H. pylori* infection in the previous studies[37-40]. In our study, the majority of family members with positive UBT (58%) were household members of trash collectors who had positive UBT, but this did not reach statistical significance. The type of familial relationship and *H. pylori* infection in the household also did not influence its prevalence among trash collectors. However, this may simply be due to the small number of family participants in our study.

The present study has many strengths. It is the first study in Thailand to look at a high-risk population of workers for *H. pylori* infection. Secondly, we used a standard and highly accurate test, UBT for the diagnosis of *H. pylori*. This study had several limitations. First, our study lacks of a suitable control group. The questionnaire was designed based on the participants' self-reported exposure with 3 degrees of variables including always, sometimes or never. This system of grading made it difficult for differentiation those participants with or without exposure. As for filtered water, we could not identify pore size of filter membrane of each commercial filter used by the participants, therefore we could not know how it could protect against *H. pylori* infection. Lastly, the number of household members participating in the study was too small for a valid analysis.

Conclusion

The prevalence of *H. pylori* infection in water trash collectors of BMA was high but there was not any significant correlation between occupational exposure risks and *H. pylori* infection; further well-designed research for occupational risk of infection is needed. However, the recent study confirmed previous studies claiming that low educational level and poor hygiene were related to *H. pylori* infection.

What is already known on this topic?

Transmission of *H pylori* mainly occurs from person-to-person, through oral-oral, gastro-oral, and oral-fecal routes. Prevalence of *H. pylori* infection is high among population with low educational level and low socio-economic status.

What this study adds?

The prevalence of *H. pylori* infection in water trash collector is higher compared with general Thai population. Drinking filtered water protect against *H. pylori* infection. The study's result may give useful information to initiate health policies for the prevention of *H. pylori* infection in at-risk occupations, even though it could not demonstrate the occupational risk.

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Potential conflicts of interest

The authors declare no conflicts of interest.

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