ORIGINAL ARTICLE

Does waterpipe smoking increase the risk of *Helicobacter pylori* infection?

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Background: In this study, we aimed to evaluate whether waterpipe smoking can be associated with the transmission of *Helicobacter pylori* infection or not. **Materials and Methods:** Between March 2018 and April 2019, 445 patients aged over 18 years old who were admitted to outpatient clinics with dyspeptic complaints were recruited for the study. Patients are divided into two groups – Group 1 is *H. pylori*-positive patients and Group 2 is negative. Waterpipe smoking, smoking, age, gender, and educational status were compared among groups. **Results:** Two hundred and sixty-one women (58%) and 184 men (42%), totally 445 patients, tested for *H. pylori* infection. Seventy-nine of 261 (30%) women and 60 of 184 (32%) men had *H. pylori* positive. One hundred and sixty-two of 445 (36%) patients were smoking cigarette and 66 of 445 (14%) patients were using waterpipe tobacco. Waterpipe smoking individuals were found to be associated with the *H. pylori* positivity ($P < 0.001$); whereas, age, gender, educational level, and smoking were not found to be statistically significant (all $P > 0.05$). In binary logistic regression analysis, waterpipe tobacco smoking was found to be the only independent predictor of *H. pylori* infection ($P < 0.001$, odds ratio = 5.51, confidence interval: 3.158–9.617). **Conclusion:** Waterpipe smoking seems to be an important risk factor for *H. pylori* infection and may be one of the reasons of high prevalence of *H. pylori* infection.

Key words: *Helicobacter pylori*, infection, waterpipe smoking

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INTRODUCTION

Helicobacter pylori is the main cause of gastric ulcer, duodenal ulcer, and nonulcer dyspepsia and is an important risk factor for stomach cancer.[1-3] Worldwide, more than 50% of the population is infected with *H. pylori* and more common in developing countries. Low socioeconomic level, poor hygiene conditions, and overcrowded are the risk factors. Although transmission route of the *H. pylori* is still not clear, interpersonal, especially in the family, seems to be the main route.[4-6]

Smoking, and also waterpipe smoking, is a common method of tobacco use in southwest Asia and northern Africa. In recent years, its popularity has increased and usage has become widespread in Europe and America, carries the same risks as smoking.[7-9] The prevalence of respiratory diseases, lung cancer, cardiovascular diseases, and metabolic syndrome is increased in waterpipe smoking. In addition, impairment in oral hygiene and high incidence of periodontal disease are common outcomes of water pipe smoking. Infectious disease such as hepatitis C virus infection has also increased.[8-10] Although the relationship between *H. pylori* and smoking has been evaluated in many studies, no study has been conducted to evaluate the relationship between *H. pylori* and waterpipe smoking. Therefore, we have designed this study whether waterpipe smoking can be associated with the transmission of *H. pylori* or not.

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METHODS

This cross-sectional study was conducted at Internal Medicine Department of Near East University Hospital, Nicosia, Cyprus. Local ethics committee reviewed and approved the study protocol in accordance with the ethical principles for human investigations. Written informed consents were obtained from all the patients.

Between March 2018 and April 2019, 445 patients aged over 18 years old who were admitted to outpatient clinics with dyspeptic complaints and who had no exclusion criteria were recruited to the study. The exclusion criteria were as follows: no history of upper gastrointestinal disease, bleeding, and surgery; patients who had received antibiotics, proton pump inhibitors, or antacids in the previous 4 weeks; history of eradication therapy for *H. pylori*; patients requiring upper endoscopy as defined in the American College of Gastroenterology dyspepsia guideline; patients using nonsteroidal anti-inflammatory agents frequently; and history of any other concomitant diseases such as acute and chronic inflammatory conditions, rheumatic diseases, malignancies, diabetes mellitus, hypertension, kidney disease, and liver disease.

We excluded patients with alarm symptoms, and therefore, patients require upper endoscopy, even if they were also *H. pylori* positive. We also evaluated *H. pylori*-negative patients for other causes of dyspepsia step by step; we considered patients with functional dyspepsia for whom we could not find a meaningful cause.

Patient's age, gender, education level, using water pipe or not, and smoking are questioned and are noted. Those who use water pipe smoking in the past 1 month, at least once a week, are considered to waterpipe smoker. Dyspepsia was defined as per Rome III diagnostic criteria, as the presence of one or more dyspepsia symptoms such as postprandial fullness, early satiation, epigastric pain, and epigastric burning that are considered to originate from the gastroduodenal region and in the absence of any organic, systemic, or metabolic disease that is likely to explain the symptoms. Stool antigen test or urea breath test was applied to patients with dyspeptic complaints.

Stool samples were collected from the patients, and quantitative ELISA for *H. pylori* antigen was performed on the stool samples as per the manufacturer's instructions. Samples showing a concentration of *H. pylori* antigen higher than 0.05 μg/ml were considered as positive. Carbon-14 urea breath test after an overnight fast, C-14 UBT (Heliprobe System, Kibion AB, Uppsala, Sweden), was performed for all enrolled patients. After ingestion of 37 kBq (1 lCi) C-14 urea capsule with 50 mL water, the breath samples were collected at 10th, 20th, and 30th min after ingestion. During this 30-min C-14 UBT urea reaction period, patients lay on the left side horizontally. The results were expressed as both counts per minute (CPM), and grading (0–1 [negative for *H. pylori* infection, CPM B [50]] and 2 [positive for *H. pylori* infection, CPM [50]]) as suggested by the manufacturer.

Education levels were divided into four groups: secondary school graduates, junior high school graduates, high school graduates, and university graduates.

Statistical analysis

All statistical analysis was performed using SPSS for Windows version 24 (SPSS, Inc., Chicago, IL, USA). Chi-square test was used to examine the association of *H. pylori*-infected patients with categorical variables including water pipe smoking, smoking, sex, and educational level. Statistical difference of the numerical variable, age was performed using independent sample *t*-test. Binary logistic regression analysis was performed to determine independent predictors of *H. pylori* infection. A two-sided $P > 0.05$ was considered statistically significant.

RESULTS

The clinical and demographic characteristics groups are presented in Table 1. During the study, 261 women (58%) and 184 men (42%) totally 445 patients tested for *H. pylori* infection. Seventy-nine of 261 (30%) women and 60 of 184 (32%) men had *H. pylori* positive. One hundred and sixty-two of 445 (36%) patients were smoking cigarette and 66 of 445 (14%) patients were using water pipe tobacco. Group ages were found to be statistically similar ($P > 0.05$). In Chi-square test, water pipe smoking individuals were found to be associated with the *H. pylori* positivity ($P < 0.001$); whereas, gender, educational level, and smoking were not found to be statistically significant (all $P > 0.05$). In binary logistic regression analysis, age, education level, and cigarette smoking were not found to be the predictors for

Table 1: Characteristics of the study population (*n*=445)

		Helicobacter pylori positivity		
	n (%)	Positive, *n* (%)	Negative	*P*
Age (mean±SD)		40.05±13.10	39.76±13.27	0.831
Gender				
Male	184 (41)	60 (33)	124	0.600
Female	261 (59)	79 (30)	182	
Education level				
Secondary school	9 (2)	5 (55)	4	0.258
Junior high school	14 (3)	4 (28)	10	
High school	194 (43)	54 (27)	140	
University	228 (51)	76 (33)	152	
Smoking cigarette	162 (36)	55 (33)	107	0.350
Water pipe smoking	66 (14)	43 (65)	23	0.000

SD=Standard deviation

H. pylori infection (all $P > 0.05$); whereas, only waterpipe tobacco smoking was found to be the only independent predictor of *H. pylori* infection ($P < 0.001$, odds ratio = 5.51, confidence interval: 3.158–9.617).

DISCUSSION

To the best of our knowledge, this is the first study evaluating the association between *H. pylori* infection and waterpipe tobacco smoking. The main findings of the study were that (i) waterpipe smoking is associated with the *H. pylori* positivity (ii) and were found to be the independent predictor of *H. pylori* infection.

Many studies have been conducted concerning the possible relation *H. pylori* and smoking. This previous study results were conflicting. In the majority of them, no relation of cigarette smoking with *H. pylori* was found.[11-14] However, in some studies, positively and negatively relation was found.[15] In our study, we found no relation between smoking habit and *H. pylori* infection. However, we did not classify patients according to their smoking duration and number of cigarettes smoked per day. Duration and frequency of cigarette smoking may have effects on *H. pylori* infection development. This may have affected our findings between smoking and *H. pylori* infection.

Water pipe smoking has the same and also more risks with cigarette smoking. There are many different types of water pipes; the basic version most frequently used has four main parts: the bowl where the tobacco is heated; the base filled with water or other liquids; the pipe, which connects the bowl to the base; and the hose and mouthpiece through which smoke is drawn. The specialty tobacco is heated, usually with burning embers or charcoal. The smoke passes through the water and is then drawn through the hose to the mouthpiece.[16] Mouthpiece changes at every use but the other parts not. Hence, this structure may be facilitating factor for infection transmission.

Arabic type water pipe is used in our region. However, there are many types of waterpipe tobacco smoking with different structures. Different types of water pipes will have different harmful effects on human health. Lai *et al*. in a study among Vietnamese men showed that smoking waterpipe tobacco increases the risk of gastric cancer.[17] Vietnamese type waterpipe tobacco does not include charcoal but Arabic type needs charcoal. This means more toxic effects on human health. Not only *H. pylori* transmission but also additional toxic effects may cause more complications such as cancer and ulcer.

The way of *H. pylori* transmission is unclear. Interpersonal transmission seems to be the main route, but environmental and parental ways are the other main reasons. Transmission events between individuals living in the same house are more frequent. Urita *et al*. investigated intrafamilial transmission of *H. pylori* and reported the mother-to-child and also grandmother-to-child transmission. They stated that mothers could transmit the infection through mouth secretions, using common spoons or tasting the child's food.[6] Water pipe smoking may be responsible for *H. pylori* transmission in a similar way. Infected smoker may spread the bacteria into water pipe, and changing the mouthpiece may not be enough. With this hypothesis, we evaluated the water pipe smoking and *H. pylori* infection and found a strong relationship between water pipe smoking and *H. pylori* infection.

We have not found relationship between *H. pylori* and gender, but in a recent meta-analysis, male sex was associated with a greater prevalence of *H. pylori* infection both in children and adults.[18] We also have not found a significant relationship between *H. pylori* and educational level although in previous studies low educational level has been found as a risk factor.[19] The study was done in a university hospital, and the hospital is located in university campus so many of our patients were university students, we think that this was the reason why we did not found a relationship between educational level and *H. pylori* infection.

CONCLUSION

In conclusion, waterpipe smoking seems to be important risk factor for *H. pylori* infection and may be one of the reasons of high prevalence of *H. pylori* infection. The prevalence of *H. pylori* is so high in Southeast Mediterranean and Middle East countries where the waterpipe smoking commonly used.

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Conflicts of interest
There are no conflicts of interest.

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