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Prevalence of *Helicobacter pylori* infection among patients referred for endoscopy: Gender and ethnic differences in Kedah, Malaysia

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ABSTRACT

Objective: To study the prevalence of *Helicobacter pylori* (*H. pylori*) infection, according to ethnicity and gender among the people of Sungai Petani, Kedah, Malaysia who undergo endoscopy. **Methods:** To study the epidemiology of *H. pylori* infection in Kedah, Malaysia population, we assessed the database of hospital admissions of the patients referred to the Endoscopy Unit at Sungai Petani Hospital for oesophagogastro-duodenoscopy (OGD) between January 2000 and December 2007. For statistical analysis, the Fisher's exact test (2- tailed test) was used. *H. pylori* infection rate was determined in 1965 consecutive patients. **Results:** Out of 1965 patients, 597 (30.4%) were positive and 1368 (69.6%) were negative for *H. pylori* infections. Generally, the prevalence rate among males (51.9%; 398/767) was significantly higher ($P<0.05$) than for females (33.1%; 199/601). In terms of ethnics, the overall prevalence showed *H. pylori* infection was commonly found among Indians and Chinese with prevalence rate of 35.6% (194/545) and 28.6% (100/350) respectively. These figures are significantly higher ($P< 0.05$) than the 28.5% (300/1051) for Malays. The prevalence rates for Malay males was lower ($P<0.05$) than those of Chinese and Indians. **Conclusions:** In conclusion, there is a significant difference in *H. pylori* infection prevalence rates among ethnic groups (highest in Indians, then Chinese and unusually low in Malays) and gender groups (highest in males) in Kedah, Malaysia.

1. Introduction

Helicobacter pylori (*H. pylori*) infection nowadays is recognized as a major causative organism for peptic cancer, gastric cancer and chronic active inflammation in humans. *H. pylori* are considered the most common bacterial infection in the world with an estimated 75% of population in developing country being infected with organism even at early age[1] and lower in the developed country (typically less than 40%) with a declining pattern worldwide[2,3]. However, as socioeconomic level varies within subpopulations of the same country, the prevalence in these subgroups can be rather different[4]. Malaysia is a developing and multiracial country composed of three main ethnic such as Malay, Indian and Chinese. These different races have exclusive habits, customs and cultural practices even though they are living together. This made it appealing to study the prevalence of *H. pylori* infection and its distribution among various ethnic groups in Malaysia.

Differences in prevalence of *H. pylori* infection between races and gender have been noted in Malaysia. Various studies conducted in Malaysia have consistently shown a higher prevalence of *H. pylori* infection among non-Malays than in Malays and among males than in females[5-8]. Apart from three major races living together in Malaysia, there are a number of native or indigenous races, particularly in East Malaysia, Sabah and Sarawak. It is generally considered that the population in northwestern (Kedah and Perlis) region is poorer and more rural than the population of the west coast of the peninsular. Kedah has a relatively heterogeneous populace constituted by the three major ethnic groups; the Malays,

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Chinese and Indians, similar to most of the other Malaysian states. In terms of population, it is the 8th most populated state. Kedah is considered the "rice bowl" of Malaysia, accounting for one third of Malaysia's total production of rice. Aagriculture is the main activity of the people in Kedah. The present study was carried out to study the prevalence of *H. pylori* infection, according to ethnicity and gender among the people of Sungai Petani, Kedah who underwent endoscopy.

2. Materials and methods

2.1. Data collection

We conducted a retrospective study based on data from Endoscopy Unit, Sungai Petani Hospital, Kedah, Malaysia databases in the period 2000-2007. Standard clinical procedures at the Endoscopy Unit, Sungai Petani Hospital, Kedah, Malaysia were followed. Written consent was given by the patients for their information to be stored in the hospital database and used for research. The work carried out was in accordance with the principles laid down in the Declaration of Helsinki for biomedical research involving humans and the ethical standards of the AIMST University committee on human and animal experimentation. In total there were 1965 consecutive patients referred to the Endoscopy Unit at Sungai Petani Hospital for oesophagogastro-duodenoscopy (OGD). All endoscopies were performed by experienced endoscopist using the Olympus GIF100 video endoscope. The patients with dyspepsia, defined as pain or discomfort centered in the upper abdomen and lasting for 1 month or more, referred by primary care physicians for upper endoscopy, are eligible for enrolment. Information on the demographic data (including ethnic and gender) and clinical data (type of symptoms and date of examination) were collected on a standard form and stored in a computerized archive to reveal the infection pattern in the population of Sungai Petani, Kedah. Patients were excluded if they had previous history of peptic ulcer, active bleeding, cancer or recent use of antibiotics or proton pump inhibitor (PPI). We choose to exclude patients with a previous history of peptic ulcer disease because many patients often cannot remember what treatment they have had in the past. Patients who had previous eradication therapy can bias the result.

2.2. Data analysis

Data were entered and analyzed using Statistical Package for Social Science (SPSS) for windows version 16.0. Univariate analysis was done using Fisher's exact test (2-tailed test) to determine the prevalence of *H. pylori* infection in the sampled population, and the difference in the prevalence across ethnicity, and gender[5]. The differences between means was considered significant when $P<0.05$.

3. Results

Total of 1965 of consecutive patients were enrolled in the study and the range of the patients was 10-99 years. These patients comprised 1063 Malays, 350 Chinese, 533 Indians and 19 others. Besides that, there were 800 females and 1165 males. Out of 1965 patients, 597 (30.4%) were positive and 1368 (69.6%) were negative for *H. pylori* infections.

Table 1 shows the prevalence rate among male and female patients enrolled in the study. Generally, the prevalence rate among males (34.16%; 398/1165) was significantly higher ($P<0.001$) than that among females (24.88%; 199/800).

Table 2 shows the prevalence of *H. pylori* according to race. The ethnic composition of the group was as follows: Malays 1063 (54.1% of subjects); Chinese 350 (17.8%); Indians 545 (27.12%) and 'other races' 19 (0.97%). The other races category composed of Thais, Vietnamese, and Cambodians. The overall prevalence of *H. pylori* infection was commonly found among Indians and Chinese with prevalence rate of 30.4 % (162/533) and 18.00% (63/350) respectively. These figures are significantly higher ($P<0.05$) than the 7.3% (78/1063) for Malays. However, there was no significant differences ($P>0.05$) in *H. pylori* infection between Malays and 'other races'.

Generally, in terms of gender and ethnic group, the prevalence rates for Malay males was lower ($P<0.05$) than those of Chinese and Indians (Table 3). But for females, such trend was different whereby the prevalence rates among Chinese females was significantly lower ($P<0.05$) compared to Malays and Indians. Besides that, there were also significantly differences ($P<0.05$) among Malay male, Indian male and Chinese female. In this association, it shows that Indian male has the highest prevalence rate than Chinese female and Malay male. This same trend has been seen in another relation of Malay female, Chinese male and Indian male. This relation also proved that the Indian males still showed a higher prevalence ($P<0.05$) infection of *H. pylori*. Although the prevalence rates of *H. pylori* infection was different among Chinese and Malays in terms of gender but Indians still shows higher prevalence rates in both gender.

Table 1

H. pylori infection rates in relation to gender.

Gender	Total	No. *H. pylori* present (%)	No. *H. pylori* absent (%)
Male	1165	398 (34.16)*	767 (65.84)*
Female	800	199 (24.88)	601 (75.12)

*$P < 0.001$ when compared with female.

Table 2

H. pylori infection rates in relation to ethnic origin.

Race	Total	No. *H. pylori* present (%)	No. *H. pylori* absent (%)
Malay	1063	78 (7.3)	985 (92.7)
Chinese	350	63 (18.0)*	287 (82.0)*
Indian	533	162 (30.4)*	371 (69.6)*
Others	19	1 (5.3)	18 (94.7)

*$P < 0.05$ when compared with Malay.

Table 3
Helicobacter pylori infection rates in relation to ethnic origin and gender.

Race	Gender	Total	*H. pylori* present n (%)	*H. pylori* absent n (%)
Malay	Male	612	194 (31.7)	418 (68.3)
	Female	439	106 (24.1)[b]	333 (75.9)[b]
Chinese	Male	190	68 (35.8)[a]	122 (64.2)[a]
	Female	160	32 (20.0)[a]	128 (80.0)[a]
Indian	Male	349	133 (38.1)[a]	216 (61.9)[a]
	Female	196	61 (31.1)[b]	135 (68.9)[b]
Others	Male	14	3 (21.4)	11 (78.6)
	Female	5	0 (0)	5 (100)

a- $P<0.05$ when compared with Malay male; b- $P<0.05$ when compared with Chinese female.

4. Discussion

Epidemiological studies have documented enormous differences in the prevalence of *H. pylori* in different gender and ethnic groups. In this study, prevalence of *H. pylori* infection was determined among the patients who had been endoscoped at Sungai Petani Hospital, Kedah, Malaysia. The overall prevalence among the patients with *H. pylori* infection was 30.4% (597 of 1965) in this study. The overall prevalence of *H. pylori* infection among patients in Kedah showed lower prevalence rates. This finding agreed with previous report by Tan and Goh, whereby the widespread awareness and diagnosis of *H. pylori* has lead to increased treatment and elimination of the decline in *H. pylori* prevalence[9].

Several studies also have shown conclusively declining in the prevalence rate of *H. pylori* infection in Asia. A more fundamental change must have been taking place by improving personal hygiene and living condition especially in Asian population. Chen *et al* has demonstrated a decreasing seroperavalence of *H. pylori* infection in 1993-2003 in Guang Zhau, southern China (from 62.5% to 47%)[10]. This similar trend of lower prevalence of *H. pylori* infection was also reported in Kelantan which was 14.1%, 19.3% and 14.0% in Penang[5,6,11]. In all these studies, it shows low prevalence of *H. pylori* infection when compared to studies in Kuala Lumpur among multi racial dyspectic patients, which were 49.1% to 50.6% and 59.1% from Singapore[12-14]. However the *H. pylori* infections that discovered in these patients can be due to contaminated uncooked vegetables, contaminated water delivery systems, mothers breast feeding with saliva-coated nipples, houseflies, overcrowding, poor hygiene, sharing beds during childhood and pre-mastication of food by mothers for their children, which have been cited as important risks for infections occurring early in childhood in the developing world[15]. The factors that contribute to an elevated risk of infection among people born in developing countries may include limited access to clean water and food supplies, poor sanitation, malnutrition and exposures to infected person outside of household. Apart from the socioeconomic factors, another possibility which may contribute for the variation in prevalence rates in different studies is the effect of NSAIDs. It has been reported that NSAIDs may be associated with an increases in the prevalence of *H. pylori* infection in relation to peptic ulcer disease[16].

Our finding also showed that Malays had the lowest *H. pylori* infection compared with those of Chinese and Indians, which is comparable to previous reports of patients who underwent upper gastrointestinal endoscopy in Penang, Kelantan, Kuala Lumpur and Singapore[5-8,11,14]. Malaysia is a multiracial country where three major Asian races live together: Malay, Chinese and Indian. The latter 2 groups are the descendents of late nineteenth and early twentieth century immigrants from China and India. A 'racial cohort' phenomenon has been postulated whereby the infection is transmitted and perpetuated within a racial group and the prevalence amongst Chinese and Indians in Malaysia reflects the prevalence in South China and South India, respectively. It has been suggested that the higher infection rates among the Chinese and Indians reflect the high prevalence rates in their countries of origin, and that the original immigrants passed the high infection rates to successive generations of their children born in Malaysia. These statements support the belief that *H. pylori* infection is acquired early in life leads to multifocal gastritis and thus predisposes the patients to symptoms later in life[17]. These people may have been infected previously without any symptoms, because *H. pylori* needs time to produce those symptoms[17]. We can postulate that when Indian and Chinese migrate from South India and South China during the high prevalence of *H. pylori* infection in South China and South India, they are infected with *H. pylori* but without any symptoms and developed symptom later in life after them being in Malaysia for long time and showed a high prevalence in Malaysia.

This fact was further supported by finding which reported Chinese immigrant in Melbourne, Australia shows seroprevalence differed between immigrants of various birth place, those born in Malaysia or Singapore have lower 43% than those in China and Hong Kong 68.2%, Vietnam 68.4% [18]. These findings were consistent with the findings of a UK study that ethnic origin was significantly associated with *H. pylori* infection, with a rate of 69% for non-UK birth compared with 40% for UK birth[19]. In addition, using chop sticks among Chinese communities is also another vital factor. Furthermore, Chinese community that used to have a high intake of salted fish and vegetables were identified as independent risk factor for gastric cancer in *H. pylori*[20].

In a recent study by Tay *et al*, seventy eight *H. pylori* isolates, including 27 Chinese, 35 Indian and 16 Malay

isolates from Malaysia were analysed by multilocus sequence typing (MLST) of seven housekeeping genes and compared with the global MLST data[21]. The results of this study showed the Malay *H. pylori* population did not form a group of its own but majority (9 of the 16 isolates studied) of it belong to the same group as the Indian isolates. The results showed that *H. pylori* follows human route of migration and reflects human ancestry. But there is no evidence that ancestral Malays migrated from India. Currently there are two theories for the origins of Malay, one being of Southeast Asian origin, sharing common ancestry with the Thais, Laotians and Cambodians. Meanwhile, the others from Southern China origin through migration went to Taiwan, then outwards to the Philippines, Borneo, Indonesia and Malaysia. However there are no supports Malays sharing direct common ancestry with Indians[21].

Therefore for the Malay population, the ancestry of *H. pylori* does not reflect human ancestry as in other populations. Studies also showed that the *H. pylori* infection rate in the Malay population is much lower than Indian population[21]. It is therefore likely that the Malay population was initially free of *H. pylori* and the *H. pylori* in the current Malay population have only recently been acquired from the Malaysian Indian community. It is possible that the Malay population lost its original *H. pylori*. However loss of *H. pylori* in modern populations is associated with improved living standards, awareness of *H. pylori* and technology of medical treatment. Besides that, smoking and drinking alcohol within Malays community is also prohibited by the rules of Islam hence factors causing *H. pylori* infection prevalence is lowered compared to Indian and Chinese communities[6].

On the other hand, communal eating habits also allow close personal contact and it's clearly seen in non Malays. The non Malays consist of Chinese and Indians has different rituals and diet consumption in their daily life that can lead to transmission of this infection. Chinese like to eat garlic which contains allicin an active agent of anti – *H. pylori* activity associated with gastroduedonal disease[22]. This statement is supported by Jonker *et al* which reported that the garlic contains wide range of thiosulphate such as allicin which is responsible for antimicrobial activity[23]. This is because important enzyme in cell membrane in *H. pylori* (urease) may contribute to strong antimicrobial effect of garlic against this microorganism. Another important study by O'Gara *et al* showed that garlic antimicrobial activity was unaffected by acidic environments in the stomach and they also reported that gastric juice also can enhances the antimicrobial activity of garlic constituents[24]. Moreover, the Malay community also consumes a lot of herbs, which appear to be protective against *H. pylori* infection, but the in vivo activities of the herbs remain unknown[6].

Our finding also showed that the prevalence rate of *H. pylori* infection was significantly higher among male patients compared with female patients. This was supported by other studies in rural Columbian Andes communities in which it was found higher infection rates in young males. A birth cohort of 21 year-olds in New Zealand also revealed a higher seropositivity in males (5.8%) than females (2.2%). In addition, other researchers also reported that males had higher risk of infection in their study[16,25]. The differences between the genders may be lifestyle and habits of male community and female community which include smoking and alcohol consumption, which could activate the infection of these bacteria[26]. A previous study in Northern Ireland also identified an association of smoking and *H. pylori* infection. And *H. pylori* infection may spread between individual through handling and sharing cigarettes. A recent study showed *H. pylori* use 70 KDa Lf receptor to enable it to obtain iron directly from human gastric (~ 10% iron stimulated) but not from the bovine Lf[27]. This can occur by inhalation of iron from tobacco smoke. The tobacco leaves contains ~84ug iron/g, hence cigarette smoking is the strongest independent risk factor. Meanwhile, menstrual blood loss can be considered as contributing factors for iron deficiency in woman that lead to lower prevalence rate of *H. pylori* infection[28]. Factors for iron deficiency also may include inadequate intake of dietary iron or food that enhance iron absorption among woman[26].

In addition, another statement correlated with studies demonstrate that there is a significant relationship between smoking and *H. pylori* infection[29-33]. This may be due to the fact that cigarette smoking predisposes an individual to peptic ulcer disease by a reduction in the protective bicarbonate layer over the gastric mucosa and may lead to increased susceptibility to *H. pylori* infection[34]. A significant relationship between the number of cigarettes smoked and *H. pylori* infection has been reported by other studies[34]. Another study found that *H. pylori* infection is more commonly found in patients with non-ulcer dyspepsia who smoked rather than in those patients who did not smoke cigarettes[35]. A recent study indicated a strong correlation between *H. pylori* infection and alcohol consumption[36]. The ingestion of alcohol beverage increased the risk for peptic ulcer in men. This effect due to consequences of liberation of more acid secretion of parietal cells stimulated by alcohol ingestion worsen the damage caused by *H. pylori*.

In summary, the prevalence of *H. pylori* infection among patients in Sungai Petani, Kedah was low. There is a significant difference in *H. pylori* infection prevalence rates among the various ethnic communities in Malaysia, with highest prevalence rate among Indians followed by Chinese and Malays. Our study also revealed lower *H. pylori* prevalence among female patients than male patients.

Conflict of interest statement

We declare that we have no conflict of interest.

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