Prevalence and Risk Factors of Helicobacter Pylori Infection in Asymptomatic Sudanese Population: A Cross-sectional Study

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ABSTRACT

Background: *Helicobacter pylori* infections are a global problem, and constitute a known cause of gastrointestinal diseases such as gastritis, peptic ulcers, and gastric malignancies; they are also implicated in extra intestinal diseases, such as chronic urticarial and peripheral arterial disease. This study aims to determine the prevalence of *Helicobacter pylori* infections in asymptomatic individuals, and to estimate the risk factors of the infection.
Methods: A cross-sectional study was conducted at Kassala Military Hospital in Sudan. A convenience sample of healthy individuals was used; 237 people were checked for eligibility. The individuals who were included to participate in the study consisted of healthy individuals, hospital staff, blood donors, and females arriving to receive antenatal care. A questionnaire was used to record the socio-demographics of the participants. *Helicobacter pylori* antibodies were detected in their blood by a rapid chromatographic immunoassay.
Results: Of the 207 participants, 92 (44.4%) were male and 115 (55.6%) were female. The prevalence of the *Helicobacter pylori* infection was 48.1%, and was significantly associated with the water source ($p = 0.02$) of the participant and whether they shared a bed with their siblings during childhood ($p = 0.016$). There was no association found between the *Helicobacter pylori* infection and sanitation methods, gender, employment status, number of rooms in a dwelling, or level of education.
Conclusion: The prevalence of the *Helicobacter pylori* infection was 48.1%, and the infection was significantly associated with the source of water and childhood sleeping arrangements.

Key words: Helicobacter pylori, asymptomatic, prevalence.

INTRODUCTION

Helicobacter pylori (*H. pylori*) is the most common bacterial infection in the world. It is a gram-negative, helically-shaped, flagellated bacterium that colonises the epithelial lining of the gastric mucosa (1).

H. pylori is implicated in the pathogenesis of a number of gastrointestinal diseases, such as gastritis, gastric ulcers, duodenal ulcers, gastric adenocarcinomas, and mucosa-associated lymphoid tissue lymphoma (2). It is also implicated in extra gastrointestinal diseases, such as idiopathic thrombocytopenic purpura, unexplained iron deficiency anaemia, and dermatological disorders such as chronic urticarial and peripheral arterial diseases (3)(4)(5).

The prevalence of *H. pylori* infection varies widely between developed and developing countries. In developing regions, the infection rate is high at approximately 80%. (6) By contrast, the infection rate is as low as 10% in developed countries (7). A high prevalence of *H. pylori* infections (65.8%) was reported in East Sudan among patients with dyspepsia (8); a prevalence of 62.2% was recorded in diabetic Sudanese patients (9); a prevalence of 40.1% was observed among Sudanese children admitted to the specialised paediatric hospitals (10); and a low prevalence rate of 21.8% was reported among schoolchildren (11).

Several factors contribute to *H. pylori* infections, including the age of individuals, their sex and socioeconomic status, the level of overcrowding in their houses, their level of education, their source of drinking water, and their sanitation facilities. Less commonly, iatrogenic transmission during endoscopy and dental procedures has been reported (12)(13)(14)(15).

The objectives of this study are to determine the prevalence of *H. pylori* infections in asymptomatic Sudanese individuals, and to estimate the risk factors of the infection, including age, sex, and socio-demographic status (level of education, number of rooms and family members, source of drinking water, sanitation method, bed-sharing behaviours, and animal ownership).

MATERIALS AND METHODS

A cross-sectional study was conducted in the east of Sudan, at Kassala Military Hospital. A convenience sample of healthy individuals was included in the study. From November 2018 to March 2019, 237 people were checked for eligibility. The inclusion criteria were: healthy individuals, hospital staff, blood donors, and females arriving to receive antenatal care. Of these, 30 individuals were excluded, the followings were considered to be exclusion criteria: age less than one year old, refused to participate in the study, or had epigastric pain, nausea, vomiting or a history of peptic ulcers. Ethical approval was obtained from the Kassala Military Hospital.

Drops of blood (serum or plasma) were obtained from the volunteers for *H. pylori* antibody detection by venipuncture; the drops were transferred to specimen area of test cassette, then the results were interpreted after 10 minutes as follow: the appearance of two coloured lines was reported as a positive result, and the appearance of one coloured line at control region was reported as a negative result. The detection was conducted by a rapid chromatographic immunoassay (AllTest Biotech), which used a combination of *H. pylori* antigen-coated particles and anti-human IgG to qualitatively detect *H. pylori* antibodies in the samples; the *H. pylori* antibody rapid test (AllTest Biotech) has a relative sensitivity of 95.5 percent and relative specificity of 91.3 percent.

A trained lab technician interviewed each participant or parent in case of child participant using the study questionnaire after an informed consent. The questionnaire included personal data (age and sex), sociodemographic characteristics, and living conditions, to investigate the risk factors of *H. pylori* infection. (12)

The collected data were analysed using the Statistical Package for Social Sciences Version 21. Descriptive statistics were used to record the variables; the range and standard deviation were used as continuous variables to report measures of dispersion; the mean was used as a measure of central tendencies; categorical variables were expressed as percentages and frequencies; and the relationships between categorical variables were assessed using Chi-square analysis. Multivariate analysis was performed to check the relation between age group and bed sharing during childhood using Chi-square analysis. Statistical analyses was carried out and a p-value equal to or less than 0.05 was considered significant.

RESULTS

There were 207 individuals included in the study, with ages ranging between 5 and 80 years. The mean age of participants was 34.8, and the standard deviation was ± 14.6. A total of 92 males (44.4%) and 115 females (55.6%) participated in the study.

Prevalence of *H. pylori* infection:

The study showed that the prevalence of the *H pylori* infection was 48.1% (n = 100). The prevalence of *H. pylori* was found to be higher in females (59.2%) than in males (40.8%). However, the differences were not statistically significant (p = 0.293).

The most common age group affected by *H pylori* was "young adult" (61.2%), followed by the "middle-age" group (19.4%), "elder" (11.2), and "children" (8.2%). However, this was not statistically significant (p = 0.566—see Table 1).

Association of *H. pylori* with risk factors:

There was no association between *H. pylori* infection prevalence and education level, occupation, or type of residence (p = 0.966, 0.221, and 0.458, respectively—see Table 1).

TABLE 1. Prevalence of H. pylori infection in asymptomatic subjects in different age groups, sex, sociodemographic characteristics, and living conditions.

VARIABLES		NUMBER	H. PYLORI POSITIVE+ (%)	P VALUE
Sex	Male	92	42(45.7%)	0.293
	Female	115	58(50.4%)	
Age group (years)	2-20	15	8(55.3 %)	0,566
	21-40	129	62(48.1 %)	
	41-60	45	19(42.2%)	
	60-80	18	11(61.1 %)	
Level of education	Illiterate	51	23(45.1%)	0.966
	Primary school	73	35(47.9%)	
	Secondary school	40	17(42.5%)	
	College/University	32	16(50%)	
Occupation	Unemployed	117	53(45.3%)	0.221
	Employed	89	45(50.6%)	
Residence	Rural	60	28(46.7%)	0.458
	Urban	148	70(47.3%)	
Housing tenure	Owned	168	80(47.6%)	0.486
	Rented	36	16(44.4%)	
Household population (persons/home)	1–3	28	14(50%)	0.833
	4–5	78	35(44.9%)	
	6+	95	47(49.5%)	
Rooms occupied Room/home	1–2	70	34(48.6%)	0.762
	3–4	128	62(48.4%)	
	5–6	2	0(0%)	
	7+	4	1(25%)	
Shared bed with parents during childhood <4years	No	38	22(57.9%)	0.123
	Yes	168	76(45.2%)	
Shared bed with siblings during childhood ≥4years	No	79	46(58.2%)	0.016
	Yes	129	52(40.3%)	
Source of drinking water	City water	201	93(46.3%)	0.024
	Lake	5	0(0%)	
	Mineral water	0	0(0%)	
Sanitation method	Pit latrine	120	54(45%)	0.272
	Septic tank	86	44(51.2%)	
Animal ownership	No	128	63(49.2%)	0.425
	Yes	77	35(45.5%)	

Chi-square test p = > 0.05

Associations between *H. pylori* and sanitation methods/living conditions:

The prevalence of *H. pylori* infection was significantly associated with the source of drinking water (p = 0.024). The drinking from city water associated with higher infection prevalence.

The prevalence of *H. pylori* infections in individuals who shared a bed with their siblings during childhood showed statistical significance (p = 0.016). Individuals who had not shared a bed with their siblings during childhood associated with higher infection prevalence than individuals who had shared a bed with their siblings during childhood.

There was no association observed between *H. pylori* infections and sanitation method (p = 0.272—see Table1).

There was no association observed between *H. pylori* infection and animal ownership (p = 0.425—see Table 1).

Multivariate analysis showed the interaction between age group and shared a bed with siblings during childhood was found to be not significant (p = 0.747).

There was no association observed between age group and shared a bed with parents during childhood (p = 0.672).

DISCUSSION

The prevalence of *H. pylori* infection varies worldwide, with higher prevalence rates being reported in developing countries. The likelihood of infection depends on several risk factors, which were surveyed in this study.

This study showed that the prevalence of *H. pylori* infections in asymptomatic individuals in Sudan is 48.1%, which is similar to other studies conducted in developing countries. A prevalence rate of 44.23% was found in Kanpur (India) (16), 51% in Saudi Arabia (17), and 53% in Turkey (18).

High prevalence rates of 86.8%, 74.4%, and 85% were found in South Africa, Pakistan, and Nigeria, respectively (19)(20)(21). However, Oceania had the lowest prevalence; for example, its prevalence was 10–25% in Malaysia, 30.6% in Australia, and 15.0 % in Indonesia (22)(23)(24).

H. pylori prevalence by sex and age group

In the current study, the prevalence of *H. pylori* was found to be higher in females (59.2%) than in males (40.8 %). However, the difference between these prevalence rates was not statistically significant, which agrees with the results of similar studies conducted in South India and Kanpur. (25) (16)

The prevalence of the *H. pylori* infection increases with age; this was demonstrated by studies in Pakistan (26) and in Harare hospitals, Zimbabwe. (12) In this study, the age group most commonly affected by *H. pylori* was "young adult" (61.2%), and the least commonly affected age group was "elder"; though this is not statistically significant, it concords well with similar studies performed in South India and Kanpur. (16)(25)

The education level correlates with socioeconomic class and hygiene practices. In our study, there was no association observed between *H. pylori* prevalence and the level of education, occupation, employment status, or residence (urban vs rural). This finding is similar to those of studies conducted in Harare hospitals, Zimbabwe and in Pakistan. (12)(26) However, other studies conducted in Mexico and the United States showed strong associations between the prevalence of *H. pylori* infection and the level of education (27)(28). This can be explained by different risk factors contributing to the *H. pylori* infection in different geographical areas.

Drinking water sources are a known risk factor for *H. pylori* acquisition. Though this study revealed a significant statistical association of *H. pylori* infection with drinking water source (p = 0.024), the results are not useful because people who drank from lakes made up only 5 individuals in the sample, none drank mineral water, and the prevalence of *H. pylori* infections among people who drank from city water (ground water source) was 44.7% (n = 201). However , studies conducted in developed countries, for example, in the United States and Japan, did not find any association between *H. pylori* infection and drinking water source (27)(28). This finding is explained by the high quality of water treatment in these countries.

Another factor that promotes *H. pylori* infection is overcrowding. *H. pylori* infection was found to be higher among individuals who had shared a bed with their siblings during childhood as reported in Simbarashe (12) and Moayyedi studies (29). One possible explanation is that poor hygiene in children promotes the spread of infection. In the current study, *H. pylori* infection was found to be higher among individuals who had not shared a bed with their siblings during childhood (58.2%; p = 0.016). The association between age group and shared a bed with siblings during childhood was found to be not significant (p = 0.747).

Sanitation methods are a recognised factor determining the acquisition of *H. pylori* infections. Sanitation aims to dispose of human excreta, which are responsible for faecal-oral diseases such as *H. pylori*. (30) This study revealed the prevalence of *H. pylori* infection among people who use pit latrines (45%) and septic tanks (51.2%). This is not statistically significant (p = 0.272), which can be explained by the lack of ideal sanitation methods in the area of study. The use of improved sanitation methods, better hygiene, and consumption of mineral water should

be encouraged as a means of reducing the acquisition and transmission of *H. pylori*, which is an important cause of chronic gastric diseases and other serious diseases such as malignancies.

This is the first study that revealed the prevalence of *H. pylori* among asymptomatic individuals in Sudan; also it explored the risk factors of the disease transmission. However, use of rapid chromatographic immunoassay to qualitatively detect *H. pylori* antibodies (IgG only) in the samples is a limitation of the diagnostic power of the test. There is a need to consider ELISA test in further studies in the future to increase the accuracy of the results.

This study explored almost all people lived on Kassala drink from city water, improving quality of water treatment as a preventive method in this area can decrease the prevalence of *H. pylori* infection. Educational programs to improve personal hygiene, increase knowledge of *H. pylori* transmission routes and related preventive methods are advised.

CONCLUSION

In the current study, the prevalence of *H. pylori* infection in the asymptomatic Sudanese population was found to be 48.1%. There was a significant association between the prevalence of *H. pylori* infection and the source of drinking water and the sharing of a bed with siblings during childhood.

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