PREVALENCE OF HELICOBACTER PYLORI AMONG FOOD HANDLERS IN A TERTIARY CARE HOSPITAL: IMPLICATION OF BETTER INFECTION CONTROL MANAGEMENT.

By

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DOI: *10.21608/ejom.2024.246443.1321*

Submit Date: *2023-12-09* ***Revise Date:*** *2024-01-16* ***Accept Date:*** *2024-01-25*

Authors' contribution: *All authors contributed equally in this work.*

Abstract

Introduction: Food handlers' health, hygiene, and adherence to proper food handling procedures in hospitals; all play a significant role in the likelihood of spreading illnesses. Helicobacter pylori (H pylori) infection is a substantial source of illness and mortality in humans, and the International Agency for Research on Cancer classifies it as a class 1 carcinogen. **Aim of Work:** To assess the prevalence of H pylori among hospital food handlers and the associated risk factors and its consecutive implication on the infection control principles for food hygiene. **Materials and Methods:** In tertiary hospital kitchens, a cross-sectional study involving 85 food handlers was conducted. All study participants received an Arabic-structured self-administered questionnaire containing questions about socio-demographic information, drinking water source, the crowding index, and hygienic behaviors while handling food. Stool samples were analyzed for H pylori antigen. **Results:** Forty of the food handlers (47.1 %) were positive for H pylori. Marital status, level of education, smoking and crowding index showed a higher statistical significant difference among positive H pylori food handlers.

Wearing gloves were significantly associated with negative H pylori status, meanwhile presence of animals in the house were significantly associated with positive H pylori. Animal presence in the house, high crowding index and wearing gloves were statically significant predictors of H Pylori status. **Conclusion and Recommendations:** The prevalence of H pylori among food handlers was relatively high, with no age, gender or residence privilege. Its risk factors included marital status, level of education, smoking and overcrowding. Wearing gloves was one of its significant predictors. Strict compliance with appropriate personal hygiene and hygienic food-handling practices is required.

Key words: Helicobacter pylori, Food handlers, Health care facility and Infection control measures. manual handling and strict adherence to safety protocols and practices to safeguard the health and well-being of workers.

Introduction

Anyone who helps with food preparation, serving, washing, or packing is considered a food handler. Food handlers can spread a wide range of diseases, and their periodic medical examination is a logical step forward in ensuring food safety (Kumar et al., 2019).

Food handlers play an important role in food safety. This accountability is more pronounced in hospitals, where patients are more vulnerable to diseases caused by bacterial contamination of food. Ignoring food safety measures in hospitals may increase the morbidity and mortality of the patients (Al Banna et al., 2022).

The International Agency for Research on Cancer classifies Helicobacter pylori (H. pylori) as a class 1 carcinogen (IARC, 1994). It is a significant source of morbidity and death in humans because it plays an important role in the development of chronic gastritis, gastroduodenal ulcer, and gastric cancer, all of which have serious consequences for the patients' quality of life (Wu et al., 2019).

The global prevalence of H pylori infection is high, ranging from 50 to 80%. The majority of infected people are asymptomatic for decades. Gastritis and peptic ulcer disease are frequently connected with clinically presenting instances (Alexander et al., 2021).

The primary route of H pylori transmission remains unknown. H pylori bacteria can be transmitted directly from one person to another via fecal-oral and oral-oral routes, or indirectly from an infected person to the environment (Zamani et al., 2017). Another potential source of H pylori is saliva (Gebara et al., 2006). Nasal mucosa may be exposed to the bacterium indirectly or serve as a reservoir for it (Bansal et al., 2016). There are also some findings that indicate the idea of water-borne transmission (Klein et al., 1991; Chakravarty and Canet, 1996).

The majority of infection risk factors are directly associated to poor living conditions, such as lower socioeconomic level, poor hygiene, a lack of sanitation, household congestion, bed sharing, and food- and waterborne transmission (Cheng et al., 2009).

There are numerous worldwide food safety programs and guidelines, such as the FAO/WHO food safety recommendations (2009) and the Australian program (2007). In Egypt, the National Food Safety Guideline is included in the national recommendations for infection control measures within hospitals, and it applies to both hospital kitchens and food handlers (MOHP, 2008), in which pre-employment and periodic medical examinations of food workers do not include H pylori testing. Furthermore, the occupational risk of H pylori infection for food handlers has received less attention.

Aim of Work

To assess the prevalence of H pylori among hospital food handlers and the associated risk factors and its consecutive implication on the infection control principles for food hygiene.

Materials and Methods

Study design: A cross sectional study.

Place and duration of the study: This study was conducted from January to March 2019 at tertiary Hospital kitchens.

Study sample: All working personnel dealing with food preparation, cooking and serving in tertiary hospital kitchens were totally 185. Sample size calculation was done using open Epi version 3 software, with anticipated frequency of H pylori positive among food handlers of 88.7% according to Gad and Hassan (2012), at 95% confidence interval and power 80%, the minimum required sample size was 85

participants. Food handlers (85) were randomly selected after their agreement to participate in the study. Inclusion criteria was a minimum working duration of one year and exclusion criteria was free gastrointestinal symptoms, not using antibiotics or proton-pump inhibitors at least 2 weeks prior to the study participation.

Study methods:

- Questionnaire

All study participants were invited to fill in an Arabic-structured self-administered questionnaire that included questions concerning sociodemographic data (age, gender, education level, occupation, and smoking habit), drinking water source, crowding index (number of persons living in the household/number of rooms, where < 2 is considered of low crowding index and greater than or equal to 2 is of high crowding index) (Brown et al., 2021), and hygienic practices during dealing with food in the hospital kitchens. Questions used were adopted from the available literature (Awuku et al., 2017, Naficy et al., 2000). Pilot testing: the preliminary data collection form was tested on 20 cases to assess the clarity and comprehension of questions used in the questionnaire, then included in the main study.

- Investigations: H pylori analysis

∑ Fecal H pylori Antigen was done using EDI™ Fecal H pylori Antigen ELISA Kit where 1-2 mL of fresh faecal samples were collected and frozen in a stool sample collection container (-20ºC) until tested.

∑ A suspension of 40mg of solid stool sample in 1 mL of 1x Assay Buffer was mixed on a vortex mixer and centrifuged at 3000 rpm for 5-10 minutes.

∑ The supernatant was utilised directly in the test.

∑ A sufficient number of anti-H Pylori antibody coated microwell strips were inserted in a frame to run the H Pylori negative control (1x Assay buffer), positive control and unknown samples in duplicate.

∑ 100 µL of controls (assay buffer as a negative control and diluted patient stool samples) were added to each designated microwell, gently mixed by tapping the plate, then covered with a plate sealer and aluminium foil to avoid light exposure and incubated at room temperature for 1 hour.

∑ The contents of each well were aspirated then washed 5 times followed by addition of 100 µL of Anti-H pylori

tracer antibody solution, mixed by tapping the plate then re-incubated covered at room temperature for 30 minutes.

∑ Each well was washed 5 times followed by addition of100 µL of ELISA HRP then incubated covered at room temperature for 20 minutes.

∑ ELISA Stop Solution (100 µL) was added into each of the wells.

∑ The absorbance was read at 450 nm then the average absorbance for each control was calculated together with both positive and negative cut-off values.

∑ Samples results were interpreted where samples showing value greater than the positive cut-off value were considered positive while samples showing results less than the negative cut-off value were considered negative

Consent

Each participant in the study gave a formal written consent after receiving a thorough information about the research work's objectives.

Ethical Approval

The study was granted approval by the Research Ethics Committee of Cairo University's Faculty of Medicine. Its approval number is N-155-2022.

Data Management

Precoded data was entered into Excel version (365) before being imported for analysis into the statistical package of social science software program, version 23 (SPSS). For quantitative data, the median and IQR quantitative variables were used, while for qualitative variables, the number and percent were used. The Shapiro test was used to determine the normality of the data (which was not normally distributed). The Chi square test, and Fisher exact test, to compare qualitative variables. Mann-Whitney U test were used to compare quantitative variables, expected cell frequency of less than 5, and quantitative variables, respectively. To identify significant determinants of H pylori positive sate, binary backward logistic regression was used. A p value of 0.05 or less was considered statistically significant.

Results

A total of 85 food handlers were included in the study. H pylori positive food handlers were 40 (47.1 %) .Their age ranged from (19-60) years with Mean ±SD (40.01 ±10.07), their yearly income was less than 3000 Egyptian pounds. All the studied food handlers were drinking tab water; 50.6 % of them were females (No =43), 88.2% of them were married (No =75) and 50% received intermediate education.

Table 1: Socio-demographic characteristics of the studied food handlers (No =85).

	H pylori Negative No=45 (52.9%)	H pylori Positive No=40 (47.1 %)	p value
Age (Mean ± SD)	39.16±10.63	40.97±9.44	0.808
Sex	**No (%)**	**No (%)**	
Female	26(57.8)	17(42.5)	
Male	19(42.2)	23(57.5)	0.16
Marital status			
Single	7(15.6)	1(2.5)	0.061
Married	36(80)	39(97.5)	**0.017***
Divorced	2(4.4)	0(0)	0.496
Residence			
Urban	34(75.6)	23(57.5)	
Rural	11(24.4)	17(42.5)	0.077
Level of education			
Lack of schooling	2(4.4)	6(15)	0.14
Elementary	23(51.1)	11(27.5)	**0.027***
Intermediate	20(44.4)	23(57.5)	0.229
Smoking			
NO	38(84.4)	25(62.5)	
Cigarette smoker	7(15.6)	15(37.5)	**0.021***
Crowding index categories			
<2	34(75.6)	8(20)	
>2	11(24.4)	32(80)	**<0.001***

*: p<0.05 is considered statistically significant.

Table (1) showed that marital status, smoking and crowding index had a statistically significant difference as being higher among positive H pylori food handlers. H pylori were statistically negative among the elementary education personnel. There was no statistically significant difference between H pylori positive and negative personals regarding age, gender and residence.

Table 2: Risk factors and infection control hygienic measures of food handlers (No =85).

	H pylori Negative No= 45	**H pylori Positive No =40**	**p value**
Duration of work (years) (Mean±SD)	13.58±8.66	18.4±9.63	0.055
Food handling stages	**No (%)**	**No (%)**	
Preparing	14(31.1)	6(15)	0.066
Cooking	8(17.8)	15(37.5)	
Serving	23(51.1)	19(47.5)	
Mask			
NO	36(80)	29(72.5)	0.416
Yes	9(20)	11(27.5)	
Gloves			
NO	12(26.7)	19(47.5)	**0.046***
Yes	33(73.3)	21(52.5)	
Overhead			
NO	42(93.3)	40(100)	0.244
Yes	3(6.7)	0(0)	
Apron			
NO	39(86.7)	37(92.5)	0.489
Yes	6(13.3)	3(7.5)	
Animals in the house			
NO	40(88.9)	25(62.5)	**0.004***
Yes	5(11.1)	15(37.5)	
Hands wash			
NO	0(0)	2(5)	0.218
Yes	45(100)	38(95)	

*:$p<0.05$ is considered statistically significant.

Table (2) showed that 47.5 % of H pylori positive personnel were serving food. Wearing gloves were significantly associated with negative H pylori status (73.3% in negative versus 52.5% in positive, p value 0.046). Animals presence in the house was significantly associated with positive H pylori personnel (37.5%). All negative H pylori wash their hands while dealing with food but only 95% of H pylori positive handlers do so with no statistically significant difference.

There was no statistically significant difference between both studied groups as regards inadequate sewage disposal ,cough and sneeze beside food (Results are not tabulated).

Table 3: Significant predictors of H pylori status among food handlers.

	B	p value	OR	95% C.I. for OR	
				Lower	Upper
Gloves (Yes/NO)	1.567	**0.028***	4.79	1.183	19.396
Animals in house(Yes/NO)	2.384	**0.008***	10.852	1.873	62.88
Crowding index (<2/>2)	3.031	**<0.001***	20.71	4.954	86.582
Duration of work(years)	0.079	0.057	1.082	0.998	1.173
Constant	-4.139	0	0.016		

OR: odds ratio; C.I.: Confidence interval; *: p<0.05 is considered statistically significant.

Binary backward logistic regression was conducted to find significant predictors of H pylori status among food handlers. The dependent variable was the H pylori status (negative/positive) and independents variables entered were age (years), sex (female/male), duration of employment (years), presence of animals in the house (Yes/NO), Crowding index(<2/>2), and wearing gloves (Yes/NO) (R square was 0.569).

Table (3) illustrated that animal presence in the house, crowding index and wearing gloves were statically significant predictors of H Pylori status which means that food handlers having animals in their houses 10 times more probable to become H pylori positive than with no animals in their houses, the crowding index more than 2 is associated 20 times with probability to be H pylori positive and adherence for wearing gloves is protective 4.79 times (OR: 10.7, 20.71, 4.79 respectively).

Discussion

Several publications emphasised the significance of food handlers in the transmission of parasitic and bacterial illnesses (Zaglool et al., 2011 and Kumar et al., 2019).

The aim of the current study was to assess the prevalence of H pylori among hospital food handlers which revealed that Helicobacter pylori positive food handlers were 47.1 % of the study population (No=40 out of 85).

Marital status, level of education, smoking and crowding index was statistically significantly higher among positive H pylori food handlers. There was no statistically significant difference between positive and negative H pylori participants regarding age, gender and residence (Table 1).

In partial accordance with the current study, Gad and Hassan (2012) studied 365 asymptomatic food handlers in Egypt and they found that the prevalence of H pylori was 88.72% among food handlers, and that H pylori were more common in men of rural origin (60.4%, p: 0.001), current smokers (p: 0.05), people of low socioeconomic status, comparatively lower education level (p :0.001), and living in high crowding index (p: 0.001). They observed that there was a high incidence of Cytotoxin-associated gene-A (Cag A) virulent strains among asymptomatic apparently healthy food handlers in Egypt, and they recommended improvements in hygiene and living conditions to reduce the prevalence of H pylori infection.

Shiferaw and Abera (2019) from Addis Ababa city, Ethiopia, partially agreed with our findings that low socioeconomic condition, poor hygiene, and inadequate sanitation were linked to H pylori high prevalence, with no statistically significant gender difference, while in contrast, household overcrowding was not a statistically significant factor associated to H pylori infection. Salem and his colleagues (2019) in their study on the prevalence of helicobacter pylori infection among farmers reported that lower socioeconomic status is a common risk factor for H pylori and that of H pylori prevalence was not statistically significantly associated to age.

Cheng et al., 2009 discovered no significant differences in gender, alcohol consumption, or smoking between H pylori positive and negative persons in their study of the incidence of H pylori infection and identification

of risk variables in rural and urban Beijing, China.

With agreement with the current results, Körkoca et al. in (2015), in their study on Helicobacter pylori stool antigen feco-prevalence in food workers in Van, Turkey ,they found that the H pylori stool antigen was present in 74 out of 154 food employees (48.05%), and the age group of 26 to 34 had the greatest feco-prevalence rate (53.5%).

Wearing gloves was substantially linked with negative H pylori status among the studied group, and presence of animals in the house were substantially related to positive H pylori patients. All negative H pylori wash their hands before dealing with food but only 95% of the positive H pylori food handlers do so with no statistically significant difference (Table 2).

There were no statistically significance for H pylori positivity regarding washing hands or other hygienic principles as coughing and sneezing nearby food among the studied group (Table 2). Andargie and his co workers (2008) from Gondar town, Ethiopia; found that hand washing after contacting dirty things and different body parts between handling food items was practiced by a few numbers of food handlers. These indicated a lack of understanding regarding food contamination due to poor hygiene standards. They hypothesized that the inadequate hygiene practices were exacerbated by the fact that the majority of food handlers were from lower socioeconomic and educational backgrounds. Furthermore, none of the food workers had received adequate training in safe food handling methods.

The lack of a pure water supply is a significant environmental risk factor that has been connected to the proliferation of H pylori (Aziz et al., 2015). Despite, only 22.5 % of the studied population reported suffering from non-proper sewage disposal (Table 2), while all of them had tap water source.

Animal in the house, high crowding index and wearing gloves were statiscally significant predictors of H Pylori status among the studied group(Table 3).Helicobacter species live in the gastric and intestinal mucosa of pets such as dogs and cats, as well as avian and wild animals such as monkeys. It is alleged that domestic animals are a common source of Helicobacter (Shaaban et al., 2023).

Overcrowding and lack of a pure water supply, particularly in developing

countries, has been identified as a key risk factor for H pylori infection due to the increased contact of the family members that might spread the infection to each other. A positive H pylori infection was found to be significantly related to a household crowding score 3 ($p = 0.011$) according to the study done by (Galal et al., 2019).

In concomitant with the current study, Hasosah et al. (2015) found that age > 10 years, bed sharing, a high number of family members, and low income remained major risk factors for H pylori infection.

Similar findings was detected by Adel et al. (2014) in their study on assessment of the knowledge, attitude and practice towards food poisoning of food handlers in some Egyptian worksites and found that, 84% of food handlers washed their hands with soap and water before preparing food, but some studies found relatively low hand washing rates in a Nigerian University campus (Okojie et al, 2012).

Limitations of the study: Small sample size and single center data source might limit the generalization of this study. Also, the cross-sectional study makes it difficult to find out causality. Despite these limitations, this study addressed an important issue of assessment of the occupational risk of H pylori infection for food handlers which had received less attention, as pre-employment and periodic medical examinations of food workers do not include H pylori testing.

Conclusion

The prevalence of H pylori among food handlers was relatively high, with no age, gender or residence privilege. Marital status, educational level, smoking and overcrowding were risk factors with higher percentage among positive H pylori food handlers. Presence of animals in the house, overcrowding and wearing gloves were statiscally significant predictors of H pylori status.

Recommendations

Hospital personnel may not only be a source of infection but also fully exposed to the infection, that is why infection control policy is important to be implemented, beside preplacement and periodic medical assessment of all the personnel is vital.

Strict devotion to personal cleanliness and sanitary food-handling practices is an effective way to prevent the spread of germs from food-handlers to patients and vice versa.

Local health authorities should implement interventions such as pre-

employment food safety training and health education programs that should be repeated on a regular basis to raise food handler awareness about the hazards of H pylori infection and the importance of proper PPE compliance. It is also advised that all food workers should receive education and training on good hygiene standards.

Epidemiological surveillance is required through regular surveys and screening in tandem with the creation of a healthcare program that includes specific medical evaluations for food handlers on a frequent basis in order to detect H pylori infection in handlers who are asymptomatic.

Conflict of interest

The authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

Funding

None.

Acknowledgement

The authors would like to thank all the workers who generously agreed to participate in the study.

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