A Study of the Association between Dietary Pattern, and Helicobacter Pylori Infection among Gastric Cancer Patients attending Benghazi Medical Center

Abstract

Stomach cancer is one of the most prevalent cancers worldwide.Stomach cancer is the most common leading cause of death in many countries.H. Pylori and many dietary factors are associated with development of stomach cancers. The currentstudy aims to assess theassociation between dietary pattern, helicobacter pylori infection and among gastric cancer patients in Benghazi Medical Center. It is a retrospective cohort study. The inclusion criterion was all adult with Helicobacter pylori and older, had confirmed immunity results for the H Pylori, stomach cancer, a body weight records, and twenty four dietary recall. Description and analysis of data was done by SPSS version 22. The prevalence of H. Pylori history among 219 subjects of the current studyis (57%). Male gender, frequent intake of fried foods were the variables associated with gastric cancer in this study.

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Keywords: H. Pylori, Dietary factors, stomach cancers.

Introduction

"Helicobacter pylori are a Gram-negative bacteria.They are present in half of the world's population and colony the human stomach. Most *H. pylori*-infected persons are asymptomatic.The presence of this pathogen in the stomach increases the risk of gastric adenocarcinoma.*H. pylori* has been classified as a class I carcinogen. The clinical manifestations of *H. pylori* infection are determined by different factors, such as host genetics, diet, and *H. pylori* strains in expression of virulence determinants". [1-3]"*Helicobacter pylori* is responsible for some of the most common chronic disorders of the gastrointestinal tract such as chronic-active gastritis, duodenal and gastric ulcer disease, low-grade B-cell mucosa associated lymphoid tissue lymphoma of the stomach, and gastric adenocarcinoma.The last one is the third leading cause of cancer death globally. The mode of infection have not yet been firmly confirmed.Different routes of infection have been suggested.However, the most commonly definedroute is that infection through the faecal-oral route, Contaminated water and foods may play a significant role in transmission of the H Pylori to humans". [4, 5]"Several authors consider *H. pylori* to be a foodborne pathogen. *H. pylori* has been detected in vegetables, seawater, drinking water, and foods of animal origin. *H. pylori* survives in complex foodstuffs such as vegetables, milk, and ready-to-eat foods". [6]"*Helicobacter pylori* invade the stomach and duodenal liningsvia different mechanisms. *Helicobacter pylori* produce ammonia to regulate pH. The ammoniaproteases, vacuolating cytotoxin A (VacA) are produced by H Pylori. All these products are toxic to epithelial cells. Consequences of*H. pylori*include chronic gastritis, and inflammation of the stomach". [7]"Ulcers in the stomach and duodenum is a resultof these manifestations". [8]"The inflammatory response caused by H Pylori induces G cells in the antrum to secrete the gastrin hormone. Gastrin stimulates the parietal cells to secrete more acid into the stomach lumen, as well as increases the number of parietal cells.More acid secretions result in duodenum ulcers, atrophy of the stomach lining and consequentlystomach ulcers. Accordingly, it may also increase the risk of gastric cancer".[9]"Itis estimated that aboutone million cases of gastric cancer are diagnosed each year, approximately 700,000 people are diagnosed each year with gastric adenocarcinoma. Accordingly, gastric canceris the fourth most common

cancer worldwide. It is the second leading cause of cancer-related deaths. In some countries, stomach carcinoma is the most common malignancy. The diagnosis of gastric cancer is delayed and most patients are diagnosed after cancer has invaded the muscularis propria due to lacking of early specific symptoms,. The five years survival rate of gastric cancer is less than 15%".[10- 12] "Two mechanisms by which *H. pylori* could promote gastric cancer. The first mechanism throughincreased host cell mutation rate by the production of free radicals near *H. pylori*. The second a "perigenetic pathway", involves cell proteins alterations. *H. pylori* induce inflammation and locally high levels of tumour necrosis factor-*α (TNF -α)* and/or interleukin 6 (IL-6)". [13]"The strain of *H. pylori* a person is exposed to may influence the risk of developing gastric cancer. Strains of *H. pylori* that produce high levels of, vacuolating toxin A (VacA) and the cytotoxin-associated gene A (CagA), cause greater tissue mutation than those that produce lower amounts or that lack those genes completely". [14]"The interplay between diet, environment and genetic predisposition is important in many diseases including cancer. Diet is recognized etiological factor. Nutrition and dietary habits and factors interact with the process of carcinogenesis in all stages of initiation, promotion and progression".[15-16]"In fact epidemiological research over the last few decades have highlighted over the contribution of dietary and nutritional factors as well as the preventive role of various phytochemicals present in certain foods in different types of cancer. The risk of gastric carcinoma is influenced by *H. pylori*characteristics, host genetic determinants and environmental elements. High dietary salt intake has uniformly been associated with an increased risk of gastric cancer". [17]"This association has been discovered in case-control studies, prospective studies, and a study that compared urinary salt excretions with gastric morbidity. A prospective Japanesestudy and a Korean case-control study reported that *H. Pylori are* common insubjects who consuming a high-salty diet had an increased risk of stomach cancer compared to *H. pylori*-infected subjects who consumed lower levels of salt".[18]"Extensive research have been conducted to study the food's antioxidants protective role against the gastric cancer development. However, less knowledge is available about interactions between dietary factors and *H. pylori* infection in stomach cancer. A randomized control trial on high risk population of developing stomach cancer revealed that management of *H. pylori* in conjunction with dietary vitamin C and β-carotene supplementation increased the regression of preneoplastic lesions after six years follow-up. However, on the following further 6 years without vitamin C and β-carotene dietary supplementation, the preventative effects disappeared. Sweden case-control study suggested that high intake of dietary vitamin C and β-carotene may lower the risk for developing stomach cancer in *H pylori*-infected individuals".*(19)*"A case-control study in Hawaii conclude that vegetable intake among subjects infected with *H. pylori* provided some protection against stomach cancer" . [20] "On the opposite side, prospective cohort study in 10 European countries concluded that there was no significant association between *H. pylori* infection, vitamin C, and the risk of developing stomach cancer". [21]This work aims to study of the association between dietary pattern, helicobacter pylori infection among gastric cancer patients attending Benghazi Medical Center. "In order to find any risk factor for gastric cancer,; the current study will analyse various socioeconomic factors, medical characteristics, including *Helicobacter Pylori* infection, dietary habits and anthropometric measurements, in a cross-sectional study". [39]

Methodology

This is a retrospective cohort study carried out from 21th December 2019 to 30th April 2020 on dietary pattern Helicobacter pylori infection and gastric cancer patients in Benghazi Medical Center. The inclusion criterion for enrolment in the present study was all adult Helicobacter pylori patients who aged eighteen years and older and had confirmed immunity results for the mentioned bacteria, and gastric cancer, a body weight records, and twenty four dietary recall.Based on this criterion a total of 219out of 241 patients were randomly approached and assessed between 4th January 2020 to 12thMarch 2020 (Period of data collection)giving a response rate of 90.87 %. The patients were approached at the respective hospitaland briefed about the purpose of the study before questionnaire was interviewer administered. Informed consent was obtained from the subjects who were also assured of the confidentiality of the information collected. The research was approved by the administration of the concerned hospital and Faculty of Public Health, University of Benghazi.All data was coded prior to being entered in a computer. Description and analysis of data was done by SPSS version 22. Level of significance was set at *P* value < 0.05.Descriptive Statistics were used to describe the subjects' characteristics.Individual variables were compared using *t* test for continuous variables and x^2 *for* categoricaldata. The contiguous variables distribution was examined for difference.

Result

Table 1 shows the age distribution; subjects were predominantly between the ages 40-59 years old (55%). The total means age ± standard deviation (SD) was 50.8 years ± 13.5.All of the subjects (100%) were of Libyan nationality. A majority of the subjects were married (70 %). Subjectswere mostly have basic level (36.5%). Those currently employed subjects are 67%.

Table (1) Subject characteristics

Age (Years)		**Total**		**Total**
		Male	**Female**	
18-39	**No.**	27	45	73
	%	13.3	22	35.3
40-59	**No.**	47	79	126
	%	21.24	34.51	55
60-79	**No.**	11	9	20
	%	5.1	4.6	9.7
Total	**No.**	87	132	**219**
	%	38.89	61.11	**100**
Age (Years) Mean ± SD		51±3	49±6.2	50±2.9

Table (2)Socio-economic characteristics of subjects

Characteristics	**Number**	**%**
Marital status		
Unmarried	18	8
Married	153	70

Widow/widower	35	16
Divorcee	13	6
Educational level		
Illiterate/RW*	19	8.7
Basic education	80	36.5
Secondary and its level	72	32.9
University degree	48	21.9
Occupation		
Employed	147	67
Unemployed	55	25
Retired	18	8

The mean duration of cancer was 13.2 months (± 15.6 S.D) and 60.0 % of the patients had been diagnosed with cancer within the past 12 months.Most of the subjects were undergoing chemotherapy (74 %). The mean duration of the therapy was 6.9 months (± 10.2) and more than half the subjects (58.5 %) had undergone their respective therapy for less than 6 months. (57.0 %) had a history of Helicobacter Pylori infection. Dyspepsia and peptic ulcerwere reported in(48.6 %) (80.3 %) of the subjects respectively.

Table (3) Medical Characteristics

Characteristics	Number	%
Cancer duration (months)		
< 6	64	29.0
6 < 12	68	31.0
12 < 24	53	24.0
≥ 24	35	16.0
Type of cancer therapy		
CT *	162	74.0
RT **	34	15.5
Both	23	10.5
Duration of therapy (months)		
< 6	128	58.5
6 < 12	54	24.5
12 < 24	28	13.0
≥ 24	9	4.0
History of Helicobacter Pylori		
Yes	125	57.0
No	94	43.0
History of Dyspepsia		
Yes	106	48.2
No	113	51.8
History of peptic ulcer		
Yes	176	80.3
No	43	19.7

A majority of the subjects (70.8 %) were not followed any special diet as a consequence of the cancer. Most of the subjects (74.0 %) did not have any food intolerances or allergies. About one-third of the subjects (37.5 %) however complained of some sort of food aversion.Only 31.5 % of the subjects use nutritional supplement as opposed to 68.5 % who denied their current use.

Table (4) Dietary Characteristics

Characteristics	Total	
	Number	**%**
Cancer special diet		
Yes	64	29.2
No	155	70.8
Diet prescribed by		
Clinician	64	100
Dietician	0	0
Self	0	0
Food intolerance/allergy		
Yes	57	26.0
No	162	74.0
Type of food intolerance/ allergy		
Dairy, meat, poultry	29	**51**
Others	28	**49**
Food aversions		
Yes	82	37.5
No	137	62.5
Total (N)	**219**	**100**
Use of supplements		
Yes	69	31.5
No	150	68.5
Total (N)	**219**	**100**
Type of supplement		
Vitamin	34	49.2
Mineral	4	6.3
Both	31	44.5
Total (N)	**69**	**100**

More than half of the subjects (67%) prefer eating salty foods such as fried salty foods, salty meat and meat contain meals, sour milk, salty cheese and other. Furthermore, (69%) of the subjects mentioned that they prefer pickled foods specially vegetables. Regarding canning foods more than half of the subjects (63%) mentioned that they prefer canning foods. Spicy and fried foods were the top preferred by the subjects; (81%) and (79%) of the subjects were preferred and like these sort of foods respectively.As per the categorization of the WHO for the BMI range, the study subjects were classified as normal, underweight and overweight and/or obese. More than half of the subjects (57%) were overweight and/ or obese while 31 % were normal as per the WHO BMI range for the elderly. Only 12 % of the subjects were categorized.

Table (5) Foods Preference characteristics:

Diet Characteristics	Total	
	Number	%
Salty foods preference		
Yes	147	67
No	72	33
Total	**219**	**100**
Pickled foods Preference		
Yes	151	69
No	68	31
Total	**219**	**100**
Canning foods Preference		
Yes	**138**	**63**
No	**81**	**37**
Total	**219**	**100**
Spicy foods Preference		
Yes	**177**	**81**
No	**42**	**19**
Total	**219**	**100**
Fried foods Preference		
Yes	**173**	**79**
No	**46**	**21**
Total	**219**	**100**

Table (6): BMI categorization

Characteristics	Total	
	Number	%
Underweight	**125**	**57**
Normal	**68**	**31**
Overweight or obese	**26**	**12**
Total (N)	**219**	**100**

A Chi Square test was carried out to see if there was any statistically significant association between the dietary habits, and H. Pylori infection among gastric cancer patients attending BMC. The researchers also haveassessed various physiological and non physiological factors including select socio-economical factors and their association with dietary habits of this sample of subjects.Male gender, frequency intake of fried foods was associated at ($p< 0.05$) with more prevalence of H. Pylori among gastric cancer patients.Male gender was associated ($p< 0.05$) with more prevalence of H. Pylori among gastric cancer patients and female gender was associated ($p< 0.05$) with less prevalence of H. Pylori among gastric cancer patients. Male as compared to females had a higher percentage of history of H. Pylori infection.Frequency intake of fried foods was associated ($p< 0.05$) with more prevalence of H. Pylori among gastric cancer patients. People who consumed frequently fried foods had a higher percentage of history of H. Pylori infection.

Table (7) Association of gender with history of H. Pylori infection among gastric cancer patients

Characteristics	History of H. Pylori infection among gastric cancer patients	
	Yes	No
Female	**67**	**33**
Male	**47**	**53**
Frequency intake of fried foods		
Yes	**71**	**29**
No	**44**	**56**

Discussion

Gastric cancer is the leading cause of cancer death with an annual incidence rate of about one million yearly. In Libya, regional studies and national reports have indicated that gastric cancer is the second highest cancer incidence rate among females after breast cancer, and the second as well in males after lung cancer. Moreover, gastric cancer is the leading cause of mortality in Libya. Helicobacter pylorus colonizes the stomach and establishes a long-term infection. Strong evidence suggests that this infection has an overwhelming impact on the development of gastric cancers in the presence of some dietary background. [22-25]In this study; the researchers assess the association between dietary pattern, helicobacter pylori infection among gastric cancer patients attending Benghazi Medical Center. Male gender and frequent intake of fried foods were variables associated with prevalence of H. pylori among gastric cancer patients. Male gender was a factor that significantly predicted H pylori infection in gastric cancer patients. Epidemiological studies on the general populations show a male preponderance in the infection rate by H pylori, although there are controversial reports representing comparable rates. In the current study researchers cannot found a study that has reported a female predominance. [26-29] However, the finding of a gender disparity in the rate of infection in the gastric cancer population is a novel finding, and may show that male are more vulnerable to develop gastric cancers after getting H pylori infection. One possible explanation that because the level of gastric ghrelin was higher in the stomach mucosa of women than in men. [30, 31] Ghrelin is a peptide hormone that plays an important role in food intake, energy homeostasis and body-weight regulation. Ghrelin possesses anti-proliferative effects on breast, lung and thyroid cell lines and exerts protective actions on the gastric mucosa. In the alimentary tract, ghrelin increases acid secretion that opposite the required condition for H. Pylori. [32] A high frequent use of cooking oil significantly associated with increased risk of H. Pylori History among stomach cancer in both males and females in the current study. Deep-oil-fried foods are common traditional component of Libyan foods and produce human carcinogens at high cooking oil temperatures. [33, 34]Cooking oil fumes contain high concentrations of human carcinogens, such as BaP and DBahA, and heterocyclic aromatic amines, due to high frying temperatures which also associated with high prevalence of H. Pylori infection. Benzo(a)pyren, chrysene, and dibenzathracene have been detected at significant levels in oil fried vegetables and fish, meats and bakeries. [35, 36]Another studies found that a high consumption of deep-fried food increases the risk of stomach cancer among people infected with H. pylori (RR=1.71, 95% CI=0.67–4.34) which was also observed among subjects who consumed fried foods frequently (OR=2.3, 95% CI=1.6–3.2).[37, 38]

Conclusion

Stomach cancer is one of the most common cancers in the world and the most common leading cause of death. *Helicobacter pylori* are bacteria that is present in half of the world's population. H. pylori and several dietary factors are associated with development of stomach cancers in any nations. The current study aims to assess theassociation between dietary pattern, helicobacter pylori infection and gastric cancer among patients attending Benghazi Medical Center. The prevalence of H. Pylori among 219subjects of the current research was (57%). Male gender, frequent intake of fried foods was the variables associated with stomach cancer. All gastrointestinal patients in Benghazi Medical Center should be routinely screened for H. Pylori due to their health and financial consequences especially in relation to gastric cancer. Early nutritional intervention strategies including nutrition education, involving a multidisciplinary team of clinicians, dieticians and nursing staff should be implemented with an appropriate follow up. Multi faceted and tailor made strategies to counteract specific malnutrition need to be planned, implemented, monitored and evaluated among the malnourished and at nutritional risk patients. Additional studies need to be carried out among gastric cancer and H. Pylori patients and related dietary factors in different settings as well as other regions of Libya to identify the specific prevalence of diet related factors associated with it.

Ethical Approval and Consent

The ethical clearance for the present study was obtained from the University of Benghazi, Faculty of Public Health, Nutrition Department. The consent from each study subject was taken directly from them after explaining the nature of the study.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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