Prevalence and screening of precancerous lesions in the upper gastrointestinal tract: A cross-sectional study in North of Iran

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Abstract

Purpose: Precancerous lesions of the UGI tract are the second major cancer-related deaths and responsible for more than ten percent of cancer-related deaths worldwide. The aim of this study was to evaluate the frequency of precancerous lesions in the upper gastrointestinal tract of patients under patronage of Imam Khomeini Relief Foundation in Guilan province as vulnerable population.

Methods: In a cross-sectional study from March 2017 to March 2018, three hundred patients under patronage of Guilan branch of Imam Khomeini Relief Foundation aged more than 40 years were enrolled. All patients were underwent endoscopy and checked for *Helicobacter pylori* infection.

Results: The most frequent lesions in the esophagus, stomach and bulb were grade A mucosal breaking (58.7%), erosions (57.0%), and ulcers (6.3%), respectively. Esophageal lesions were higher in the age more than 60 years (P=0.036). Smokers and patients with familial history of cancers in the 2ndand 3rd grade of relatives had more lesions in the bulb (P=0.005 and P=0.010, respectively). Female patients, those with age lower than 50 years and no-smoker had lower frequency of intestinal metaplasia (IM) (P=0.024, P=0.030, and P=0.003, respectively). Also, there was positive association between gastric atrophy and age (P=0.009). Furthermore, chronic active gastritis were seen more frequently in male patients (P=0.003) and smokers (P=0.010). Significant positive association between consumption of fish meat and occurrence of IM was detected (P=0.010).

Conclusions: Male gender, higher age and smoking for IM and male gender, higher BMI and smoking for *H. pylori* infection were the predictive risk factors. It seems early diagnosis of precancerous lesions help to prevent cancers and to increase the survival rate.

Introduction

Precancerous lesions of upper gastrointestinal (UGI) tract are multifactorial diseases resulting from a persistent cellular damage caused by long-term exposure to various carcinogens [1]. Precancerous lesions of the UGI tract are the second major cancer-related deaths and responsible for more than 10% of cancer-related deaths worldwide [2,3]. Intestinal type of gastric adenocarcinoma, as the most common form of UGI precancerous lesions, occur in an inflammatory conditions related to the *Helicobacter pylori* infection and towards atrophic gastritis, intestinal metaplasia (IM) and finally progress to glandular dysplasia and adenocarcinoma [4].

Currently, the global burden of cancer has grown which is due to the aging process of the global population, along with the harmful behaviors such as smoking especially in developing countries[5]. In the Iran, cancer is the third leading cause of death after cardiovascular disease and stroke according to the Ministry of Health data [6,7]. In Iran, gastrointestinal cancers are one of the most prevalent cancers and account for 38% of all cancers and 44.4% of cancer mortalities [8-10].

Most of patients with undiagnosed gastric cancer are asymptomatic and showed symptoms when the cancer is in its final stages. At that time, diagnosed diseases usually cannot be treated and therefore reduce the prognosis and survival [11]. Based on this fact that precancerous lesions become cancerous one in the later stages plus the high prevalence of UGI cancers in Guilan province, and finally this note that early diagnosis of precancerous lesions increases the survival rate, we aimed to evaluate the frequency of precancerous lesions in patients under patronage of Imam Khomeini Relief Foundation in Guilan province as vulnerable population.

Materials And Methods

Patients

In a cross-sectional study from March 2017 to March 2018, all patients aged more than 40 years who were under patronage of Imam Khomeini Relief foundation and had GI problems referred to the Endoscopy ward of Razi Hospital affiliated to the Guilan University of Medical Sciences were enrolled. All patients referred systematically by the Head of the Department of Health and Social Insurance of the Guilan branch of Imam Khomeini Relief foundation from cities over the Guilan province. Patients who consumed antibiotics, proton pump inhibitors (PPI) or H_2 blockers during the past two weeks, used warfarin or aspirin during the past one week, or had history of GI cancers or surgeries, endoscopy intolerance, and history of chronic renal or cardiopulmonary failures were excluded. All included patients provided written informed consent and the aims of the study were described for all of them.

Data collection

Demographic information include age, sex, height, weight, alcohol consumption, smoking, dietary regimen, and physical activity were obtained from all patients using face to face questionnaire. Body mass index (BMI) was calculated and expressed as kg/m^2.

Endoscopic evaluation

All patients were fasted overnight and underwent endoscopy by an expert GI man. Five samples from lesser and greater curvature of antrum, angularis, body of lesser curvature, and fundus of stomach in 10% buffered formalin for histopathological evaluations and one sample from antrum for checking *H. pylori* infection by rapid urease test (RUT) were harvested from each patient. Pathological samples were stored in 10% buffered formalin and then sectioned by microtome to prepare histopathological lesion. The slides were stained using hematoxylin and eosin and evaluated by an expert pathologist who blinded about the study.

Ethical consideration

Informed consent was obtained from each participant. The study protocol was approved by the Ethics Committee of Guilan University of Medical Sciences.

Statistical analysis

All analysis were performed using IBM SPSS version 20.0. Descriptive analysis was done and the frequency and percentage of different variables based on different detected lesions are presented. The association between different qualitative variables were analyzed using Chi-square test. Generalized linear model was performed to evaluate the predictive risk factors for IM and *H. pylori* infection. P<0.05 was considered as significant difference. Figures were drawn using GrapPad Prism 7.0.

Results

The frequency of abnormal findings in the upper GI and their associations with *H. pylori* infection are presented in Table 1. As shown, the most frequent lesions in the esophagus, stomach and bulb were grade A mucosal breaking (58.7%), erosions (57.0%), and ulcers (6.3%), respectively. Among patients with mucosal breaking, one patient had adenocarcinoma and two patients had chronic gastritis. No significant associations were found between site and type of lesions with *H. pylori* infection (P>0.05).

Table 1. Frequency of lesions in the esophagus, stomach and bulb and their associations with *H. pylori* infection.

		H. pylori			
Parts	Frequency	Positive	Negative	P value	Description
Esophagus				0.300	
Without lesions	96(32.0)	59(61.5)	37(38.5)		
With lesions	204(68.0)	118(57.8)	86(42.2)		
Hiatal Hernia	72(24.0)	38(52.8)	34(47.2)		Small lesions
Mucosalbreaking	176(58.7)	104(59.1)	72(40.9)		Grade A
CLE	2(0.7)	0(0)	2(100)		Short segment
Varices	1(0.3)	1(100)	0(0)		Grade II
Nodule (mass)	1(0.3)	1(100)	0(0)		In lower part
Stomach				0.400	
Without lesions	14(4.7)	9(64.3)	5(35.7)		
With lesions	286(95.3)	168(58.7)	118(41.3)		
Masses		2(33.3)	4(66.7)		Three masses were < 5 mm,
Fundus	2(0.7)				and other 3 masses were between 5-10 mm
Body	2(0.7)				
Antrum	1(0.3)				
Prepyloric	1(0.3)				
Ulcers		5(83.3)	1(16.7)		Two ulcers were < 5 mm,
Angularis	1(0.3)				and other 4 ulcers were between 5-10 mm
Antrum	5(1.7)				
Hyperemia	98(32.7)	48(49.0)	50(51.0)		
Nodularity	19(6.3)	13(68.4)	6(31.6)		
Pylorus-deformity	1(0.3)	0(0)	1(100)		
Atrophy	9(3.0)	7(77.8)	2(22.2)		
Erosion	171(57.0)	108(63.2)	63(36.8)		
Petechia	1(0.3)	0(0)	1(100)		
Hypertrophied	1(0.3)	1(100)	0(0)		
Diverticulitis	1(0.3)	1(100)	0(0)		
IM				0.070	
Without	246(82.0)	140(56.9)	106(43.1)		
With	54(18.0)	37(68.5)	17(31.5)		
Bulb				0.100	
Without lesions	281(93.7)	163(58.0)	11(42.0)		
With lesions	19(6.3)	14(73.7)	5(26.3)		

CLE, columnar-lined esophagus.

Some patients had two or more lesions.

The associations between demographic and socioeconomic states with *H. pylori* infection, and endoscopic lesions in the esophagus, stomach and bulb are presented in Table 2. As demonstrated, the prevalence of *H. pylori* infection was 59% (177 of 300 patients) and male patients were more infected by *H. pylori* than female patients (70.7% vs. 55.1% respectively, P=0.018). Also, esophageal lesions were most frequent in the patients with age more than 60 years (*P*=0.036). Moreover, smoking showed significant associations with *H. pylori* infection (*P*=0.045) and occurrence of lesions in the bulb (*P*=0.005). Patients with familial history of cancers in the 2nd and 3rd grade of relatives had more lesions in the bulb (*P*=0.010).Gastric masses were more seen in the body and fundus while ulcers were more seen in the antrum. Totally, 6 male patients with age more than 60 years had gastric masses and these masses were more prevalent in BMI > 30 kg/m^2. In addition, exposure to harmful industries and having familial history of cancers in the first grade of relatives was predisposing factor for occurrence of gastric masses.

Table 2. Associations of demographic data and socioeconomic state with H. pylori infection and endoscopic lesions of esophagus, stomach and bulb.

				Endoscopic lesions							
	H. pylori			Esophagus			Stomach			Bulb		
Variables	Positive	Negative	P	Yes	No	P	Yes	No	P	Yes	No	P
Age (years)			0.458			0.036			0.971			0.213
< 50	67(58.8)	47(41.2)		69(60.5)	45(39.5)		109(95.6)	5(4.4)		4(3.5)	110(96.5)	
50 - 60	68(63.0)	40(37.0)		74(68.5)	34(31.5)		103(95.4)	5(4.6)		10(9.3)	98(90.7)	
> 60	42(53.8)	36(46.2)		61(78.2)	17(21.8)		74(94.9)	4(5.1)		5(6.4)	73(93.6)	
Gender			0.018			0.391			0.343			0.494
Male	53(70.7)	22(29.3)		54(72.0)	21(28.0)		70(93.3)	5(6.7)		6(8.0)	69(92.0)	
Female	124(55.1)	101(44.9)		150(66.7)	75(33.3)		216(96.0)	9(4.0)		13(5.8)	212(94.2)	
BMI (kg/m^2)			0.134			0.550			0.797			0.549
< 25	3(33.3)	6(66.7)		7(77.8)	2(22.2)		9(100)	0(0)		0(0)	9(100)	
25 - 30	45(54.2)	38(45.8)		53(63.9)	30(36.1)		79(95.2)	4(4.8)		4(4.8)	79(95.2)	
> 30	129(62.0)	79(38.0)		144(69.2)	64(30.8)		198(95.2)	10(4.8)		15(7.2)	193(92.8)	
Marital status			0.499			0.844			0.554			0.382
Single	5(71.4)	2(28.6)		5(71.4)	2(28.6)		7(100)	0(0)		1(14.3)	6(85.7)	
Married	172(58.7)	121(41.3)		199(67.9)	94(32.1)		279(95.2)	14(4.8)		18(6.1)	275(93.9)	
Education			0.993			0.981			0.973			0.150
Illiterate	82(59.0)	57(41.0)		96(69.1)	43(30.9)		132(95.0)	7(5.0)		8(5.8)	131(94.2)	
Before diploma	81(58.7)	57(41.3)		93(67.4)	45(32.6)		132(95.7)	6(4.3)		10(7.2)	128(92.8)	
Diploma	12(60.0)	8(40.0)		13(65.0)	7(35.0)		19(95.0)	1(5.0)		0(0)	20(100)	
Academic	2(66.7)	1(33.3)		2(66.7)	1(33.3)		3(100)	0(0)		1(33.3)	2(66.7)	
Exposure to harmful industries			0.898			0.217			0.244			0.873
Yes	21(60.0)	14(40.0)		27(77.1)	8(22.9)		32(91.4)	3(8.6)		2(5.7)	33(94.3)	
No	156(58.9)	109(41.1)		77(66.8)	38(33.2)		254(95.8)	11(4.2)		17(6.4)	248(93.6)	
Smoking			0.045			0.281			0.967			0.005
Yes	32(72.7)	12(27.3)		33(75.0)	11(25.0)		42(95.5)	2(4.5)		7(15.9)	37(84.1)	
No	145(56.6)	111(43.4)		71(66.8)	35(33.2)		244(95.3)	12(4.7)		12(4.7)	244(95.3)	
Alcohol consumption			0.786			0.960			0.700			0.651
Yes	2(66.7)	1(33.3)		2(66.7)	1(33.3)		3(100)	0(0)		0(0)	3(100)	
No	175(58.9)	122(41.1)		202(68.0)	95(32.0)		283(95.3)	14(4.7)		19(6.4)	278(93.6)	
Familial history of cancers			0.148			0.641			0.937			0.010
Grade 1	40(52.6)	36(47.4)		45(59.2)	31(40.8)		73(96.1)	3(3.9)		2(2.6)	74(97.4)	
Grade 2	20(48.8)	21(51.2)		29(70.7)	12(29.3)		40(97.6)	1(2.4)		3(7.3)	38(92.7)	
Grade 3	8(57.1)	6 (42.9)		6(42.9)	8(57.1)		14(100)	0(0)		1(7.1)	13(92.9)	

The relationships between demographic data and socioeconomic state with upper GI pathological findings are presented in Table 3. As shown, female patients, those with age lower than 50 years and those were no-smoker had lower frequency of IM (P=0.024, P=0.030, and P=0.003, respectively). Also, there was an increase in the frequency of gastric atrophy from 0% to 7.7% with increase of the patient's age (P=0.009). Furthermore, chronic active gastritis were seen more frequently in male patients (P=0.003) and smokers (P=0.010). Totally, 54 patients had IM and among them, 36 patients had incomplete (type III) of IM. Three patients had adenocarcinoma in which 3 (1.0%) cancers were in the stomach and 1 (0.3%) cancer was in the esophagus.

Table 3. Associations of demographic data and socioeconomic state with upper GI pathological findings.

	Intestinal metaplasia			Atrophy			Peptic ulcer gastritis			Gastritis		
Variables	Yes	No	P	Yes	No	P	Adenocarcinoma	Chronic gastritis	P	Specific	Chronic active	P
Age (years)			0.030			0.009			1.000			0.930
< 50	12(10.5)	102(89.5)		0(0)	114(100)		0(0)	0(0)		50(43.9)	64(56.1)	
50 - 60	25(23.1)	83(76.9)		3(2.8)	105(97.2)		2(50.0)	2(50.0)		46(42.9)	62(57.4)	
> 60	17(21.8)	61(78.2)		6(7.7)	72(92.3)		1(50.0)	1(50.0)		39(50.0)	39(50.0)	
Gender			0.024			0.171			1.000			0.003
Male	20(26.7)	55(73.3)		4(5.3)	71(94.7)		2(100)	0(0)		23(30.7)	52(69.3)	
Female	34(15.1)	191(84.9)		5(2.2)	220(97.8)		1(25.0)	3(75.0)		112(49.8)	113(50.2)	
BMI (kg/m^2)			0.470			0.078			1.000			0.246
< 25	3(33.3)	6(66.7)		1(11.1)	8(88.9)		1(100)	0(0)		5(55.6)	4(44.4)	
25 - 30	14(16.9)	69(83.1)		0(0)	83(100)		0(0)	0(0)		43(51.8)	40(48.2)	
> 30	37(17.8)	171(82.2)		8(3.8)	200(96.2)		2(40.0)	3(60.0)		87(41.8)	121(58.2)	
Marital status			0.210			0.638			ND			0.957
Single	0(0)	7(100)		0(0)	7(100)		0(0)	0(0)		3(42.9)	4(57.1)	
Married	54(18.4)	239(81.6)		9(3.1)	284(96.9)		1(25.0)	3(75.0)		132(45.1)	161(54.9)	
Education			0.633			0.825			0.135			0.701
Illiterate	27(19.4)	112(80.6)		4(2.9)	135(97.1)		0(0)	1(100)		64(46.0)	75(54.0)	
Before diploma	25(18.1)	113(81.9)		5(3.6)	133(96.4)		2(66.7)	1(33.3)		58(42.0)	80(58.0)	
Diploma	2(10.0)	18(90.0)		0(0)	20(100)		1(50.0)	1(50.0)		12(60.0)	8(40.0)	
Academic	0(0)	3(100)		0(0)	3(100)		0(0)	0(0)		1(33.3)	2(66.7)	
Exposure to harmful industries			0.888			0.317			ND			0.655
Yes	6(17.1)	29(82.8)		2(5.7)	33(94.3)		0(0)	0(0)		15(42.9)	20(57.1)	
No	48(18.1)	217(81.9)		7(2.6)	258(97.4)		3(50.0)	3(50.0)		120(42.9)	145(54.7)	
Smoking			0.003			0.759			1.000			0.010
Yes	15(34.1)	29(65.9)		1(2.3)	43(97.7)		1(100)	0(0)		13(29.5)	31(70.5)	
No	39(15.2)	217(84.8)		8(3.1)	248(96.9)		2(40.0)	3(60.0)		122(47.7)	134(52.3)	
Alcohol consumption			1.000			0.759			ND			0.463
Yes	0(0)	3(100)		0(0)	3(100)		0(0)	0(0)		1(33.3)	2(66.7)	
No	54(18.2)	243(81.8)		9(3.0)	288(97.0)		3(50.0)	3(50.0)		134(45.1)	163(54.9)	
Familial history of cancers			0.634			0.167			ND			0.851
Grade 1	16(21.2)	60(78.9)		0(0)	76(100)		0(0)	0(0)		38(50.0)	38(50.0)	
Grade 2	3(12.5)	21(87.5)		1(2.4)	40(97.6)		1(25.0)	3(75.0)		14(58.3)	10(41.7)	
Grade 3	2(22.2)	7(77.8)		0(0)	14(100)		0(0)	0(0)		6(66.7)	3(33.3)	

ND, not determined.

Associations between dietary habitations and physical activity with *H. pylori* infection and IM are presented in Figure 1 and Figure 2, respectively. No significant associations were detected in neither dietary habitations nor physical activity with *H. pylori* infection (P>0.05), except significant association between consumption of fish meat and occurrence of IM (P=0.010).

Finally, regression model study revealed that just male sex, higher age and smoking for IM and male sex, higher BMI and smoking for *H. pylori* infection were the predictive risk factors in this specific population (Table 4).

Table 4. Regression model of certain demographic variables for intestinal metaplasia and H. pylori infection.

	Expected (95% CI)	
Variables	Intestinal metaplasia	*H. pylori* infection
Sex		
Male	Ref.	Ref.
Female	0.4 (0.2-0.9)	0.5 (0.2-0.8)
Age (years)		
< 50	0.4 (0.1-0.9)	
50-60	0.1 (0.5-2.1)	
> 60	Ref.	
BMI (kg/m^2)		
< 25		0.3 (0.07-1.2)
25-30		0.7 (0.4-1.2)
> 30		Ref.
Smoking		
Yes	Ref.	Ref.
No	0.3 (0.1-0.7)	0.4 (0.2-0.9)

Discussion

In the present study, the frequency of different gross and histopathological lesions in the upper GI tract and some of related risk factors in the patients under patronage of Imam Khomeini Relief foundation in Guilan province were reported. Grade A mucosal breaking, erosions, and ulcers were the most frequent lesions in the esophagus, stomach and bulb, respectively. We found esophageal lesions as the most frequent lesion in the patients with age more than 60 years. Totally, male patients were more infected by *H. pylori* and had more frequency of chronic active gastritis and IM. In addition, patients with age higher than 50 years and smokers had higher frequency of IM. Gastric atrophy was more prevalent in the higher age. Smoking showed significant associations with *H. pylori* infection and chronic active gastritis. Patients with familial history of cancers in the 2nd and 3rd grade relatives plus patients who were smoker had more lesions in the bulb. In the dietary pattern, just significant association was detected between consumption of fish meat and occurrence of IM.

The onset of gastric nodules is typically in the fourth decade of life and increase as the age increases, with the highest prevalence for male in the seventh decade and for female in the higher ages [12].Our findings are similar to this fact and all our 6 patients with gastric nodules had age more than 60 years. The history of GI cancers in the first degree relatives is an important risk factor for GI cancer [13]. However, we didn't find similar association which may be due to low sample size of this study. Also, similar to those we found, it has been reported that the prevalence of gastric cancer in men is two times more than female[14] which is related to the protective effects of sexual hormones[15,16].

Different prevalence were reported for *H. pylori* infection such as 89.2% in Ardabil [17], 80% in Babol [18] and 69% in Tehran [19]all from Iran, and 39.3% in Japan [20], 25%-62% in China [21,22], 62% in Taiwan [23], and 35.8% in Poland [24], worldwide. It has been cleared that20-50% of people living in the developed countries and 80% of them in the developing countries had infected by *H. pylori* [25,26]. The association of socioeconomic states, alcohol consumption and smoking, age and dietary factors with prevalence of *H. pylori* were reported previously [27-29]. For instances, we reported that 40% of children in Rasht had *H. pylori* infection [30]. Here, we also found that patients in the age range of 50-60 years had higher prevalence of *H. pylori* infection and two other age categories on both sides of this group had lower prevalence of infection. On the other hand, more prevalence of *H. pylori* infection in the female in comparison to male was reported by Ghadimi and collaborator from Mazandaran province, Eastern neighbor of Guilan province[18], which is opposite to our finding. Furthermore, Ozden and colleagues reported that male and female were affected in an equal ration [31]. Their results also confirmed in another study from China with 2380 patients and lack of any significant gender associated differences were seen in *H. pylori* infection [32]. However, Alazmi and coworkers from Kuwait [33] and Ito and collaborators from Japan [34] reported that the prevalence of *H. pylori* infection in male was significantly higher than female. Our findings are similar to those reported by Alazmi et al. and Ito et al., and we also found significant higher prevalence of *H. pylori* infection in male against female.

Gastric cancer is one of the most common cancer worldwide and related mortality is also too high [35]. In addition, although the esophageal cancers account for less than 5% of all cancers in Iran, their prevalence are increasing steadily worldwide [36]. Our reported rates of adenocarcinoma (1% in the stomach and 0.3% in the esophagus)were higher than those reported by Malekzadeh and coworkers from Ardabil who found 0.3% and 0.1% adenocarcinoma in antrum and cardiac part of stomach without any adenocarcinoma in the esophagus [17]. One of the possible causes of esophageal adenocarcinoma is obesity and overweight. It has been predicted that due to the epidemic obesity in Iran which is associated with the epidemic of gastroesophageal reflux, the prevalence of this type of cancer will significantly increase[37]. In addition, the male sex is associated with occurrence of adenocarcinoma [37]. Our only patient with esophageal adenocarcinoma was male and had BMI more than 30 kg/m^2.

In our study, precancerous lesions of IM and atrophic gastritis were seen in 54 (18%) and 9 (3%) patients, respectively. Most of our patients with IM were type III (incomplete) which can be led to dysplasia [38]. Our detected prevalence of IM was higher than those reported by Malekzadeh et al., from Ardabil which was 8.7% of antral and 0.3% of cardiac regions [17] and other regions around the world with lower risk of gastric cancer such as Thailand [39], Argentina [40],but similar to other findings by Ajdarkosh et al [41] and Hoed et al [42]. The amount of gastric mucosal atrophy depends on several factors, including *H. pylori* infection, age, nutrition and geographical and genetic factors[43]. One of the possible reasons for the lower prevalence of gastric atrophy in this study in comparison to those reported by Malekzadeh and collaborators [17], is the lower prevalence of *H. pylori* infection. We found more prevalence of IM in male and in the age category of 50-60 years. On the other hand, 17 patients had IM but were negative about *H. pylori* infection. Male sex and higher age were reported as risk factors for precancerous lesions[44]. Additionally, precancerous gastric lesions, including IM, increase with age especially in the presence of *H. pylori* infection[45]. Indeed, in intestinal type of gastric cancer, progression from atrophic gastritis to intestinal metaplasia and then dysplasia and eventually adenocarcinoma occurs during several years[46] and therefore, their prevalence are more higher in older age categories. Based on the detection of IM in the patients without *H. pylori* infection and low sensitivity of RUR, it seems that these patients must to be rechecked for *H. pylori* infection using more sensitive methods such as urea breath test.

We found higher age for IM, higher BMI for *H. pylori* infection and male sex and smoking for both as risk factors. The significant association between smoking and increased risk of cancer were reported for cardiac and non-cardiac gastric cancers [37,47-49]. About dietary factors, significant association between consumption of fish meat and occurrence of IM was detected. Although this association may be looks strange, but it can due to contamination of fish meat to mercury[50,51].

Conclusively, in the present study which conducted in a specific population in a high risk area of GI cancers, it has been confirmed that upper GI endoscopy and taking esophageal and gastric biopsies in patients with or without obvious lesions can help to diagnosed atrophic gastritis, IM, and esophageal lesion and also been tolerable by patients. Early diagnosis of these precancerous lesions help to prevent their conversion to cancerous ones and increased the survival rate.

Declarations

Compliance with ethical standards

This study was conducted in compliance with the provisions of the Helsinki Declaration. The study was approved by ethics committee of Guilan University of Medical Sciences.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Figures

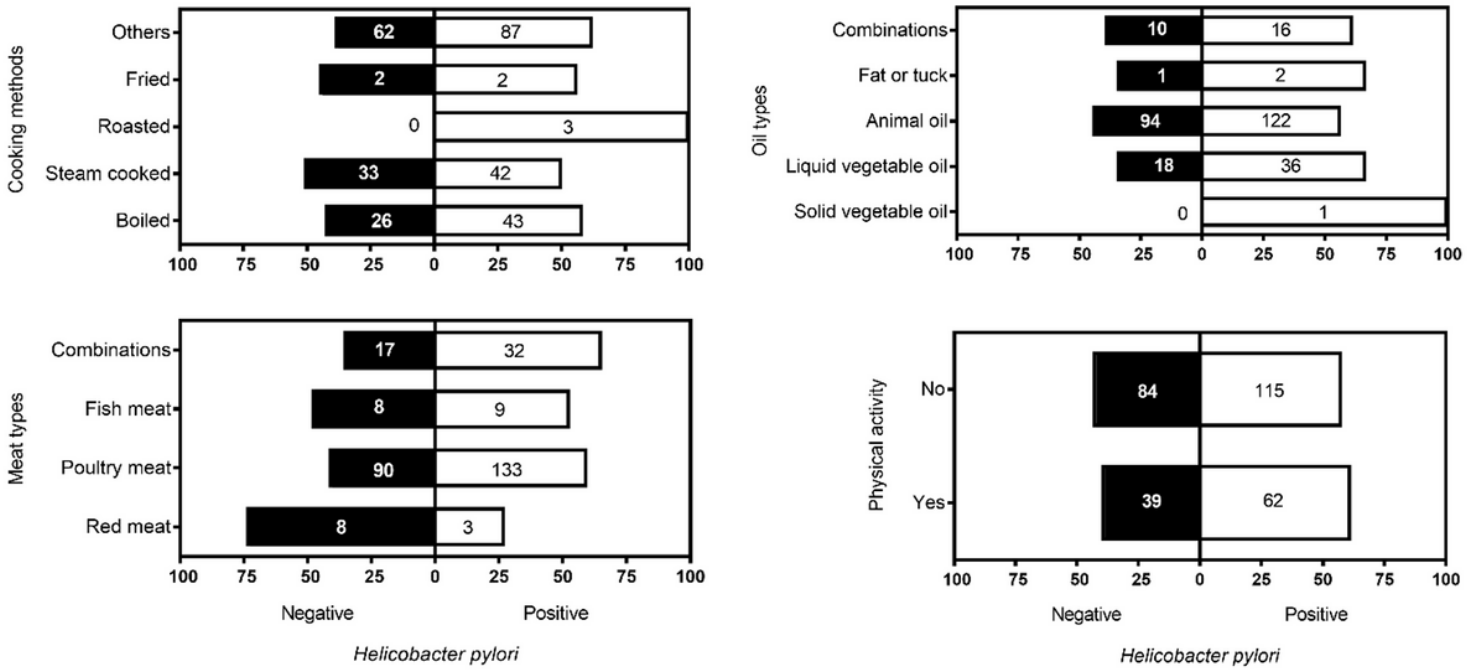

Figure 1

Frequency and percentage of Helicobacter pylori infection based on some dietary habitations include cooking methods, oil types and meat types plus physical activity.

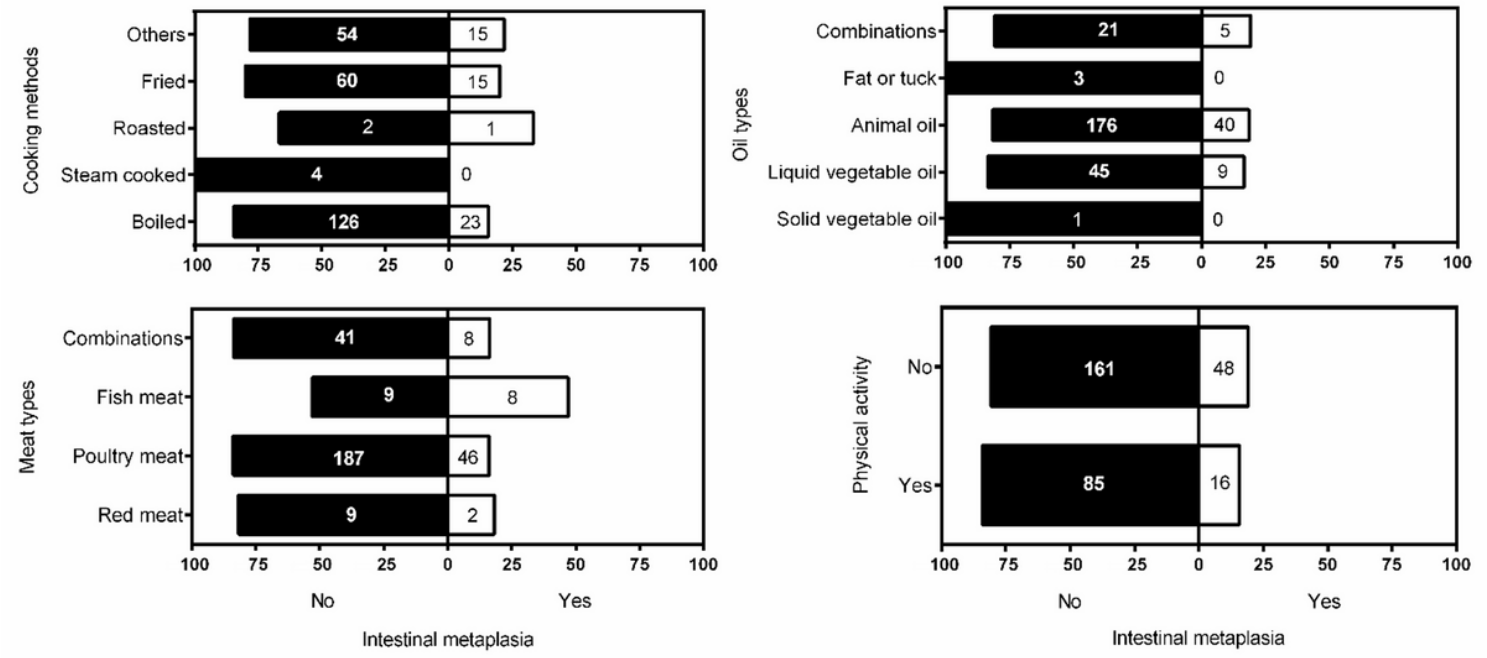

Figure 2

Frequency and percentage of having intestinal metaplasia based on some dietary habitations include cooking methods, oil types and meat types plus physical activity.