Prevalence Rate Of Giardia Lamblia/Helicobacter Pylori Co-Infections In Khartoum State, Sudan

Nusaiba Fadul Mustafa Ahmed, Tayseer Elamin Mohamed Elfaki, Mohieldin Elsayid

Abstract: The study aimed to determine the prevalence rate of Giardia lamblia/ Helicobacter pylori co-infections in Khartoum State, Sudan. A cross-sectional study was carried out during the period between May to December 2015. A total of 100 subjects were included in this study, the age ranging between (1-80) years, the mean age was (29± 19) years old. Stool samples were taken from all subjects included in the study, in addition to; clinical and parasitological data were obtained and recorded. Out of 100 subjects, (14 (14%)) were positive for G. lamblia by using direct wet mount and (22 (22%)) were positive by using formal ether concentration technique (FECT) (p=0.000). Out of 100 subjects, (30 (30%)) were positive for H. pylori when detected by using H. pylori antigen test. The study showed that the prevalence of G. lamblia was higher in females (11 (11%)) than in males (3 (3%)) (p=0.193). Also, H. pylori prevalence was higher in females (17 (17%)) than in males (13 (13%)) (p=0.390). The prevalence rate of G. lamblia was higher (5(5%)) in the age group (16- 25) and (46-65) years old by using direct wet mount (p=0.053), while the prevalence rate of H. pylori was higher (9 (9%)) in the age group (1-15) years old (p=0.424). The study revealed that the prevalence rate of G. lamblia and H. pylori co-infections were (5%), (9%) by using direct wet mount and formal ether concentration technique respectively. This study indicated that the prevalence rate of G. lamblia and H. pylori in the study area were (14%), (30%) respectively and co-infection was (5%), with no significant value for co-infection (p=0.615).

Key words: Prevalence rate, Giardia lamblia, Helicobacter pylori, Co-infection.

Introduction:

Gastrointestinal infections are major causes of morbidity and mortality throughout the world, and particularly in developing countries. Causes of gastrointestinal disease include a wide variety of bacteria, viruses and parasites [1]. In low-income countries co-infections involving several different pathogens commonly occur. Several recent cross-sectional studies from different locations, have reported a potential association between Giardia lamblia and Helicobacter pylori. Both organisms colonize the gastrointestinal tract in their human hosts and both organisms are known to infect children at a high rate [2]. Giardiasis occurs worldwide and may infect up to a third of the population in developing countries. The disease was reported from other mammals also, which serves to make it difficult to eradicate [3]. Approximately about 200 million of people in the world are with clinically manifested giardiasis, with 500,000 new cases per year [4]. G. lamblia has a worldwide distribution. Epidemiological surveys have shown that parasitic diarrhoea in children is primarily due to G. lamblia infection, particularly in areas with poor sanitation. It has been estimated that about 200 million people are infected each year in Africa, Asia and Latin America. In the industrialized countries, overall prevalence rate of giardiasis is 2-5%. However, in developing countries, G. lamblia infects children early in life with a prevalence rate of 15-20% in children younger than 10 years is common [5]. Diagnosis of Giardia by conventional microscopic methods following the application of fecal concentration techniques, especially Zinc sulphate flotation and centrifugation remains a relatively reliable indicator of infection [6]. Other methods of diagnosis include examination of duodenal contents by aspiration or biopsy with endoscopy with the aid of permanent stains is essential for more identification [3]. Enzyme immunoassay (ELISA) is highly sensitive and specific. For these reasons, in the last years, ELISA coproantigen test developed as alternative methods for the diagnosis of giardiasis [7]. Molecular techniques particularly polymerase chain reaction (PCR) based procedures have greater sensitivity and specificity than the conventional diagnostic methods for diagnosis of Giardia [6]. H. pylori is one of the most common bacterial infectious agents; it inhabits the stomachs of more than half of the world's population. Globally, the prevalence of H. pylori infection in developing countries is markedly higher than that in developed countries. Moreover, the acquisition of H. pylori seems to occur at higher rates in developing countries [8]. Infection with H.pylori occurs worldwide, with about 50% of the world's population is estimated to be infected. In developing countries 70-90% of the populations are infected, while developed countries ranged from 25 to 50% [9]. H. pylori is present on the gastric mucosa of fewer than 20% of persons younger than 30 years but increases in prevalence to 40-60% of persons age 60 years, including persons who are asymptomatic. Acute epidemics of gastritis suggest a common source for H. pylori [10]. In Sudan, information about the prevalence of H. pylori infection is very patchy, and there is only one study which showed high prevalence (80%) of H. pylori infection among patients with symptoms of gastritis, 56% with duodenal ulcer, while 60% with duodenitis and 16% apparently look normal [11]. Diagnostic methods are divided into invasive and non invasive categories. Invasive methods that require endoscopy include; culture, Campylobacter like organism test (CLO), direct gram stain, histology, PCR, and fluorescence insitue hyperdization (FISH). While the non invasive methods that do not require endoscopy include; serology, urea breath test (UBT) and H. pylori stool antigen test (Hp sAg) [12]. Laboratory identification of H. pylori by culture of gastric biopsy specimens, examination of stained biopsies for the presence of bacteria, or detection of urease activity in the biopsies. Urinary excretion of ammonia also can be used for diagnosis [9]. Urea breath test which in vivo test, based on detection for urease activity in patient breath which indicate H. pylori infection [10]. Serological tests include presence of human IgG antibodies against H. pylori. Antibody levels decline after treatment for infection and hence the positive antibody levels may indicate current or past infection [13]. The faecal monoclonal antigen test has a high sensitivity, specificity and accuracy. The faecal test can be performed on humans in all age groups and gives a rapid result without the need for sophisticated laboratory equipment [14]. PCR can be performed rapidly and cost-effectively, and it can be used to identify different strains of bacteria for pathogenic and epidemiologic studies [15]. The

main objectives of this study were to study the prevalence rate of Giardia lamblia/ Helicobacter pylori co-infections in Khartoum state, Sudan, to determine the prevalence of G.lamblia and H. pylori in Khartoum State, to compare between wet mount and formal ether concentration techniques for detection of G. lamblia and to estimate the existence of co-infection between G. lamblia and H. pylori.

Materials and methods:

Study design:
A cross-sectional study.

Study area:
The study was conducted in Khartoum State, the capital of the Sudan. It lies between longitudes 31.5-34east and latitude 15-16 north in an area, about 28.165 square kilometers. It is bordered on the north and the east sides by the River Nile State, on the northwestern side by the Northern State, and on the eastern and southern sides by Kassala, Gedaref and Gezira States [16].

Study duration:
The study was conducted in the period from May to December 2015.

Study population:
The study was carried out on patients that were clinically suspected to have gastrointestinal disorder.

Sample size:
Sample size was obtained according to the following equation:
$N=t^{2*}p\ (1-p)/M^2)$
N= sample size
t= the normal standard deviation (t=1.96)
p= the frequency of occurrence of G. lamblia (7%)
M=the degree of precision (0.05%)
N= 1.96*1.96*0.07*(1-0.07)/0.05*0.05=100
The study was conducted on hundred clinically suspected patients.

Sampling:
Hundred stool samples were collected from participants. 100 questionnaires were filled by the same participants.

Sampling methods:

Collection of faecal samples:
Patients were advised to pass the stool samples directly into a plastic cup with a tight fitting lid. About 20- 40 grams of formed stools or 5- 6 spoonfuls for watery stools were collected. All specimens were labeled with patient's name, age, sex, and date of collection [17].

Parasitological methods:
For detection of G. lamblia, stool samples were screened using direct wet mount and formal ether concentration technique as described by Chakarova (2010) [7] and Cheesbrough (1998) [18] respectively.

Direct wet mount:
A small sample of faeces was placed on a glass slide and mixed with a drop of 0. 9% solutions of NaCl and the slide was covered with a glass cover slip and examined for the presence of cysts of parasites at 10× and 40× magnification.

Formal ether concentration technique (FECT):
About 1 g of faeces (pea-size) was emulsified in 4 ml of 10% formal saline. 3-4 ml of 10% formal saline were added and mixed well by shaking. Then sieved in a beaker and transferred to centrifuge tube. A 3- 4 ml of diethyl ether were added, stoppered and mixed for 1 minute. Then centrifuged at 750- 1000 rpm for 1 minute, layers of faecal debris, ether and formal saline were discarded by using plastic bulb pipette. The sediment was resuspended, mixed and transferred to slide, covered with cover glass, and then examined microscopically using (10x, 40x). FECT used to determine the intensity of G. lamblia infection as described by Cheesbrough (1998) [18] was expressed as:

Scanty: 1-3 stage/ preparation
Few: 4-10 stage /preparation
Moderate: 11-20 stage /preparation
Many: 21-40 stage /preparation
Very many: over 40 stage /preparation

Sensitivity and specificity of direct wet mount:
The sensitivity and specificity were calculated regarding FECT as gold standard, as described by Lalkhen and McCluskey (2008) [19]:

Sensitivity = TP/ (TP+FN)
TP= True positive
FN= False negative
Specificity= TN/ (TN+FP)
TN= True negative
FP= False positive

Bacteriological methods:

H. pylori antigen rapid test (H. pylori Ag Rapid Test):
The use of rapid immune chromatographic test (ICT) for the qualitative detection of H. pylori antigen in fresh fecal samples as described by manufacturer. Instructions given by the manufacturer were followed. Stool collection device was opened and using collection stick to pierce the stool sample, then the collection stick was replaced to stool device and was shacked vigorously. On the test device, 2 drops of the solution was dispended into the sample well. Results were read after 15 minutes of adding the specimen.

Data collection:
The primary data were collected by using questionnaire to obtain information that of help to the study. Variables included in the questionnaire were: age, gender, education levels, occupation, symptoms and previous infections.

Data analysis:
The results obtained were analyzed by computerized program of statistical package for social science (SPSS version 16) by using frequency, mean, and chi-squire test. Then data were presented in figures and tables.

Ethical consideration:
The approval was taken from College of Medical Laboratory Science-Sudan University of Science and Technology. Consent was taken from all participants or their guardians before being enrolled in the study. All participants were informed for this study.

Results:
A total of 100 study subjects were included in this study. Age ranging from 1-80 years, the mean age was 29± 19 years old. Out of 100 participants, 37(37%) were males and 63(63%) were females (Table 1). Study subjects were divided into six age groups as follow: (1-15), (16- 25), (26-35), (36-45), (46-65), and (>66 years old), frequencies of age groups were 27 (27%), 20 (20%), 17 (17%), 15 (15%), 19 (19%) and 2 (2%) respectively (Table 2). Out of 100 subjects, 14 (14%) and 22 (22%) were positive for G. lamblia when using direct wet mount and FECT respectively (Table 3). Out of 100 subjects, the prevalence rate of G. lamblia was higher in females 11 (17.5%) than in males 3 (8.1%) by using direct wet mount (p=0.193) (Table 4), and when using FECT was increased to 18 (28.6%) in females and 4 (10.8%) in males (p=0.038) (Table 5). The prevalence rate of G. lamblia by using direct wet mount according to age groups (1- 15), (16- 25), (26- 35), (36- 45), (46- 65), and >66 years old were 7.4%, 25%, 5.9%, 0%, 26.3%, and 50% respectively (p=0.053) (Table 6). The prevalence rate of G. lamblia using FECT according to age groups (1- 15), (16- 25), (26- 35), (36- 45), (46- 65), and >66 years old were 14.8%, 30%, 17.6%, 6.7%, 36.8%, and 50% respectively (p=0.209) (Table 7). Out of 14 positive cases for G. lamblia, 7 (50%) with low level of education, while 7 (50%) with high level of education (p=0.019) (Table 8). Out of 14 positive cases for G. lamblia, 7 (50%) with student, 5 (35.7%) with house wives, 2 (14.3%) with officer and there was no infection with preschool and free laborers (p=0.160) (Table 9). Out of 100 subjects, 15 (15%) had previous infection with G. lamblia, among those 5 (33.4%) were positive and 10 (66.6%) were negative for G. lamblia. While 85 (85%) had no previous infection with G. lamblia, among those 9 (10.5%) were positive and 76 (89.4%) were negative for G. lamblia (p=0.019) (Figure 1). Out of 100 subjects, 30 (30%) were found to be positive for H. pylori by using stool antigen test (Table 11). Out of 100 subjects, the prevalence rate of H. pylori was higher in males 13 (35.1%) than in females 17 (27%) (p=0.390) (Table 12). The prevalence rate of H. pylori according to age groups, (1-15), (16- 25), (26- 35), (36- 45), (46- 65), and >66 years old were 33.3%, 15%, 35.3%, 20%, 42.1% and 50% respectively (p=0.424) (Table 3.13). Out of 30 positive cases for H. pylori, 20 (66.6%) with low level of education, while 5 (16.6%) with medium and 5 (16.6%) with high levels of education (p=0.023) (Table 14). Out of 30 positive cases for H.pylori, 7 (23.4%) with pre-school, 4 (13.4%) with students, 11(36.6%) with house wives, 3 (10%) with officer and 5 (16.6%) with free laborers (p=0.008) (Table 15). Out of 100 subjects, 22 (22%) had previous infection with H. pylori, among those 6 (27.3%) were positive and 16 (72.7%) were negative for H. pylori. While 78 (78%) had no previous infection with H. pylori, among those 24 (30.7%) were positive and 54 (69.3%) were negative for H. pylori (p=0.752) (Figure 2). Out of 100 subjects, co-infection was present in 5 (5%) of study subjects when using direct wet mount (p=0.615) (Table 17). Out 100 subjects, co-infection was present in 9 (9%) of study subjects when using FECT (p=0.291) (Table 18). Out of 100 stool samples, 14 (14%) were positive for G. lamblia when using direct wet mount, 8 samples were negative by direct wet mount and positive by FECT, while 22 (22%) were found to be positive by FECT (p=0.000) (Table 19). According to the formula mentioned in materials and methods the sensitivity of direct wet mount was (63.6%) (Table 20). While the specificity was (100%) (Table 21). Out of 22 (22%) positive samples, the intensity of G. lamblia was expressed as; 9 (40.9%) were few infection, 7 (31.8%) were moderate and 6 (27.3%) were many infection (p=0.000) (Figure 3).

Table (1): *Frequency of study subjects according to gender:*

Gender	Frequency	Percentage (%)
Male	37	37%
Female	63	63%
Total	100	100%

Table (2): *Frequency of study subjects according to age groups:*

Age groups (years)	Frequency	Percentage (%)
1- 15	27	27%
16- 25	20	20%
26- 35	17	17%
36- 45	15	15%
46- 65	19	19%
>66	2	2%
Total	100	100%

Table (3): *Prevalence of G. lamblia by using direct wet mount and FECT:*

Technique	G. lamblia		Prevalence
	No. examined	No. positive	
Direct wet mount	100	14	14%
FECT	100	22	22%

Table (4): *Prevalence of G. lamblia by using direct wet mount according to gender:*

Gender	No. examined	No. positive	Prevalence
Male	37	3	8.1%
Female	63	11	17.5%

p=0.193

Table (5): *Prevalence of G. lamblia by using FECT according to gender:*

Gender	No. examined	No. positive	Prevalence
Male	37	4	10.8%
Female	63	18	28.6%

p=0.038

Table (6): *Prevalence of G. lamblia by using direct wet mount according to age groups:*

Age groups (years)	No. examined	No. positive	Prevalence
1- 15	27	2	7.4%
16- 25	20	5	25%
26- 35	17	1	5.9%
36- 45	15	0	0%
46- 65	19	5	26.3%
>66	2	1	50%

p=0.053

Table (7): *Prevalence of G. lamblia by using FECT according to age groups:*

Age groups (years)	No. examined	No. positive	Prevalence
1- 15	27	4	14.8%
16- 25	20	6	30%
26- 35	17	3	17.6%
36- 45	15	1	6.7%
46- 65	19	7	36.8%
>66	2	1	50%

p=0.209

Table (8): *Prevalence of G. lamblia by using direct wet mount according to education levels:*

Education levels	G. lamblia	
	No. positive	Prevalence
Low	7	50%
Medium	0	0%
High	7	50%
Total	14	100%

p=0.019

Table (9): *Prevalence of G. lamblia by using direct wet mount according to occupation:*

Occupation	G. lamblia	
	No. positive	Prevalence
Pre-school	0	0%
Students	7	50%
House wives	5	35.7%
Officer	2	14.3%
Free laborers	0	0%
Total	14	100%

p=0.160

Table (10): *Relationship between G. lamblia and clinical symptoms:*

Symptoms	G. lamblia		Total	p. value
	Positive	Percentage (%)		
Diarrhea	6	13.6%	44	0.926
Nausea	8	13.8%	58	0.944
Fatigue	10	16.4%	61	0.388
Abdominal pain	14	15.5%	90	0.179
Bloating	9	24.3%	37	0.023
Loss of weight	9	21.5%	42	0.068
Loss of appetite	5	8.5%	59	0.056
Vomiting	1	8.3%	12	0.546
Headache	1	5.5%	18	0.254
Fever	0	0%	7	0.268

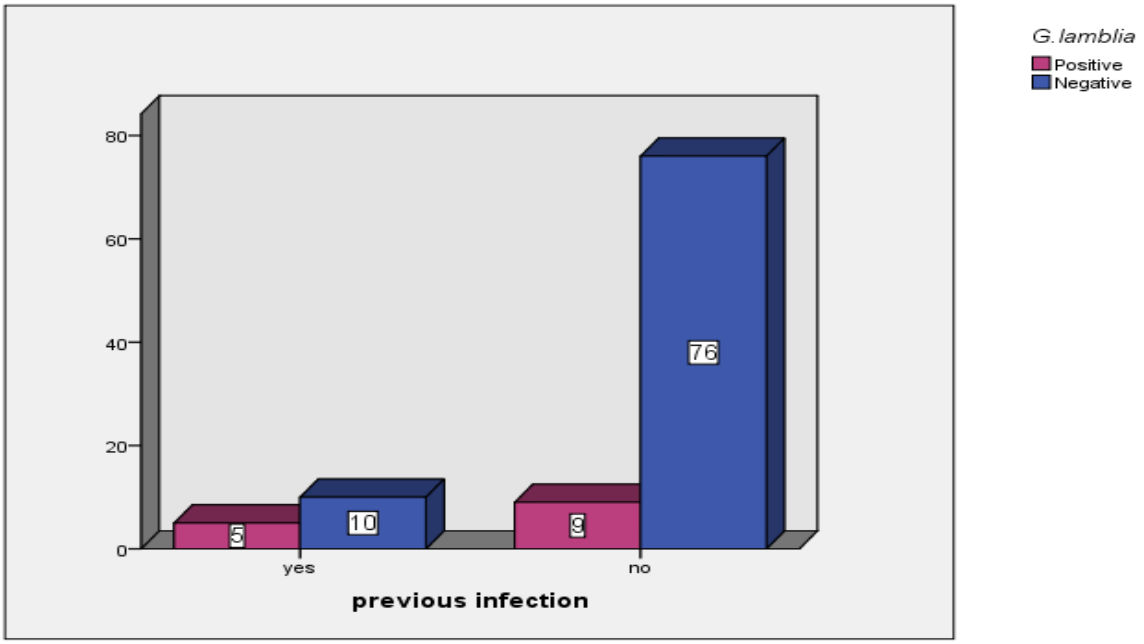

Figure (1): *Prevalence of G. lamblia according to previous infection*

Table (11): *Prevalence of H. pylori by using H. pylori Ag Rapid Test:*

Technique	H. pylori		Prevalence
	No. examined	No. positive	
H.pylori Ag Rapid Test	100	30	30%

Table (12): *Prevalence of H. pylori by using H. pylori Ag Rapid Test according to gender:*

Gender	No. examined	No. positive	Prevalence
Male	37	13	35.1%
Female	63	17	27%

p=0.390

Table (13): *Prevalence of H. pylori by using H. pylori Ag Rapid Test according to age groups:*

Age groups (years)	No. examined	No. positive	Prevalence
1- 15	27	9	33.3%
16- 25	20	3	15%
26- 35	17	6	35.3%
36- 45	15	3	20%
46- 65	19	8	42.1%
>66	2	1	50%

p=0.424

Table (14): *Prevalence of H. pylori by using H. pylori Ag Rapid Test according to education levels:*

Education levels	H. pylori	
	No. positive	Prevalence
Low	20	66.6%
Medium	5	16.6%
High	5	16.6%
Total	30	100%

p=0.023

Table (15): *Prevalence of H. pylori by using H. pylori Ag Rapid Test according to occupation:*

Occupation	H. pylori	
	No. positive	Prevalence
Pre-school	7	23.4%
Students	4	13.4%
House wives	11	36.6%
Officer	3	10%
Free laborers	5	16.6%
Total	30	100%

p=0.008

Table (16): *Relationship between H. pylori and clinical symptoms:*

Symptoms	H. pylori		Total	p. value
	Positive	Percentage (%)		
Diarrhea	21	47.7%	44	0.001
Nausea	17	29.3%	58	0.860
Fatigue	19	31.1%	61	0.754
Abdominal pain	30	33.3%	90	0.029
Bloating	15	40.5%	37	0.078
Loss of weight	17	40.5%	42	0.052
Loss of appetite	18	30.5%	59	0.894
Vomiting	3	25%	12	0.687
Headache	2	11.1%	18	0.053
Fever	1	14.2%	7	0.347

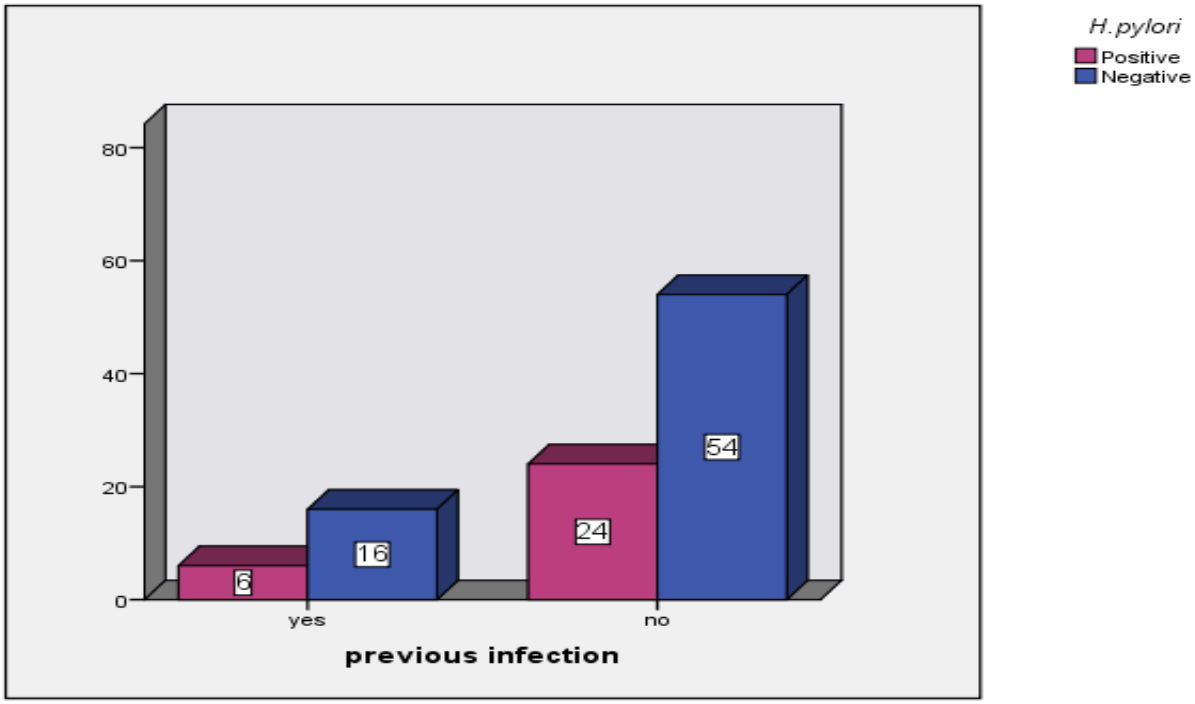

Figure (2): *Prevalence of H. pylori according to previous infection*

Table (17): *Co-infections of G. lamblia and H. pylori by using direct wet mount and H. pylori Ag Rapid Test:*

		H. pylori		Total
		Positive	Negative	
G.lamblia	Positive	5	9	14
	Negative	25	61	86
	Total	30	70	100

p=0.615

Table (18): *Co-infections of G. lamblia and H. pylori by using FECT and H. pylori Ag Rapid Test:*

		H. pylori		Total
		Positive	Negative	
G. lamblia	Positive	9	13	22
	Negative	21	57	78
	Total	30	70	100

p=0.291

Table (19): *Comparison between direct wet mount and FECT:*

		FECT		Total
		Positive	Negative	
Direct Wet mount	Positive	14	0	14
	Negative	8	78	86
	Total	22	78	100

p=0.000

Table (20): *Sensitivity of direct wet mount:*

		FECT		Total	Sensitivity %
		Positive	Negative		
Direct Wet mount	Positive	14	0	14	63.6%
	Negative	8	78	86	
	Total	22	78	100	

Table (21): *Specificity of direct wet mount:*

		FECT		Total	Specificity %
		Positive	Negative		
Direct Wet mount	Positive	14	0	14	100%
	Negative	8	78	86	
	Total	22	78	100	

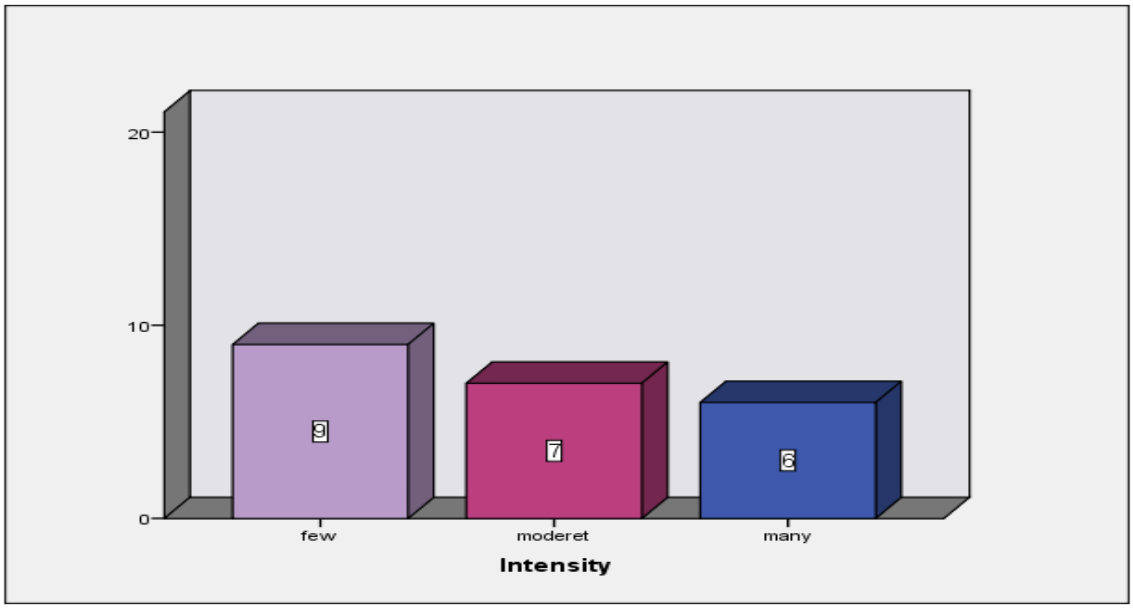

Figure (3): *Detection of intensity of G. lamblia by using FECT*

Discussion:

Co-infection with several different pathogens occurs commonly in developing countries. G. lamblia parasite is considered the most common protozoan infection in human. H. pylori was accepted as a main cause of gastritis and gastritis associated diseases, Co-infection of H. pylori and G. lamblia is common for their similar mode of transmission and strong correlation to socio-economic levels [20]. The present study showed that the prevalence rates of G. lamblia as detected by using direct wet mount was (14%), while it was increased to (22%) when using formal either concentration technique (FECT) (p=0.000). These results were similar to results obtained by Eltayeb et al. (2012) [21] and disagreed with the result which was reported by Gabbad and Elawad (2014) [22] in Khartoum State (33.4%). The current study revealed that the prevalence of G. lamblia was higher in females (17.5%) than in males (8.1%), by using direct wet mount (p=0.193) and when using FECT was increased to (28.6%) in females and (10.8%) in males (p=0.038), these results were not in agreement with Yakoob et al. (2005) [23] who found that the prevalence of G. lamblia was higher in males (72%) than in females (28%) in Pakistan. The present study showed that the prevalence rate of G. lamblia was higher (50%) in the age group >66 years old by using direct wet mount (p=0.053) and when using FECT the highest infection rate (50%) was found in the same age group >66 years old (p=0.209), these results were not in line with Iraqian study which was done by Raza and Sami (2009) [24] who showed that the highest rate of infection (17%) was among the age group (6-10) years old. The reason for the differences in the gender and age distribution was probably due to varying sample size, age groups, geographical locations, and time periods of the studies [25]. With regard to educational levels, the high infection rate of G. lamblia was reported among those with low and high education levels (50%) (p=0.019) which indicated that the prevalence of G. lamblia was affected with level of education. In the present study, the highest infection rate of G. lamblia according to occupation was found among the students (50%) (p=0.160). This result was similar to that obtained by Raza and Sami (2009) [24]. The present study showed that there was no relationship between G. lamblia and clinical symptoms except bloating (p=0.023) this finding disagreed with the finding obtained by Yakoob et al. (2005) [23] who revealed that the most common symptoms were abdominal pain and diarrhea. The current study showed that, 15 out of 100 subjects (15%) had previous infection with G. lamblia, among those, 5 (33.4%) were positive and 10 (66.6%) were negative for G. lamblia. While 85 (85%) had no previous infection with G. lamblia, among those, 9 (10.5%) were positive and 76 (89.4%) were negative for G. lamblia (p=0.019). It means that an infection was affected by previous one. In the present study, the prevalence of H. pylori was (30%) when using stool antigen test, this result was not consistent with another Sudanese study which based on antibody detection (74.7%) [11], the higher prevalence rate may be due to detection of antibodies which are relatively remaining positive for years after successful eradication of H. pylori. The result of this study, showed that the prevalence rate of H. pylori infection was higher in males (35.1%) than in females (27%) (p=0.390). This result was disagreed with a study conducted in Yemen by Bin Mohanna et al (2014) [26] who found that the prevalence in females was (67%) and in males was (33%). According to age groups, the highest infection rate (50%) in this study was detected in >66 years old (p=0.424). This result disagreed with a study done by Hamid and Eldaif (2014) [11] in Sudan which showed the high prevalence rate of infection among age group (30-50) years old. According to educational levels the results showed that the highest infection rate of H. pylori was (66.6%) among those with low education, followed by (16.6%) in both medium and high levels (p=0.023). This result indicated that the infection was affected by education level which was reflected in the degree of personal hygiene. In the current study, the prevalence of H. pylori according to occupation was found to be higher in house wives 11 (36.6%), followed by pre-school 7 (23.3%), students 4 (13.3%), officer 3 (10%), and free laborers 5 (5%) (p=0.008). The present study showed that the most common symptoms in H. pylori infection were abdominal pains (30%) (p=0.029) and diarrhea (21%) (p=0.001); so that abdominal pain and diarrhea symptoms occurred significantly more frequent in H. pylori infected patients. The present study revealed that, out of 100 subjects, 22 (22%) had previous infection with H. pylori, among those, 6 (27.3%) were positive and 16 (72.7%) were negative for H. pylori, while 78 (78%) had no previous infection with H. pylori, among those, 24 (30.7%) were positive and 54 (69.3%) were negative for H. pylori (p=0.752). The results showed that FECT was more accurate than direct wet mount for detection of G. lamblia (p=0.000). The sensitivity of direct wet mount was (63.6%), while the specificity was (100%). In the present study, co-infections of G. lamblia and H. pylori were (5%), (9%) by using direct wet mount and FECT respectively (p=0.291). These results disagreed with the results of Shafie et al. (2009) [27], who revealed that co-infections of G. lamblia and H. pylori were found in 4 patients out of 130 (3.8%) in Iran. The present study showed that G. lamblia and H. pylori infections were more distributed in the study area; this may increase the chance for development of co-infections between them.

Conclusion:

The study concluded that G. lamblia infection was less prevalent compared with H. pylori infection in the study area, prevalence rates of co-infections with H. pylori and G. lamblia were (5%), (9%) in subjects under study by using direct wet mount and FECT respectively. Females were found to be more affected than males in infection by both pathogens. The prevalence of G. lamblia and H. pylori was higher in the age group >66 years old than other age groups. The study concluded that co-infections of G. lamblia and H.pylori are possibly present in the study area.

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