Histopathological Study of Upper Gastrointestinal Tract for Helicobacter Pylori and Giardiasis in Egyptian Children

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Abstract

Background: G. lamblia is a common worldwide parasitic infection which colonizes the upper part of small intestine causing giardiasis.

Aim of the Work: This study aims to detect gastric giardiasis in children receiving antacid drugs and undergoing upper endoscopy at El Mounira Children Hospital, Cairo University. In addition to study the effect of H. pylori on colonization of gastric mucosa by G. lamblia trophozoites and assess the associated histopathological changes in gastric and duodenal mucosa.

Subjects and Methods: 100 patients (1 to 15 years of age) of both sexes (60% males & 40% females) were classified into group I includes 70 patients receiving antacid drugs and group II includes 30 patients not receiving antacid drugs. All patients were subjected to history taking, clinical examination, stool analysis, endoscopy, gastric and intestinal biopsy taking and detection of Giardia coproantigen in stool by ELISA. Biopsies were stained with Haematoxylin & Eosin, Giemsa and Masson trichrome stains.

Results: Abdominal pain, flatulence, vomiting and diarrhea constituted the most frequent complains among studied population. In 58% of cases upper endoscopy was normal while endoscopic findings included distal oesophagitis (20%), esophageal varices (14%), gastritis (8%), duodenitis (8%) and gastric ulcer (2%). G. lamblia trophozoite was detected in 5.7% of cases combined with H. pylori in group I and associated with chronic gastritis (75%), lymphocytic gastritis (50%), metaplasia (50%) and atrophic gastritis (25%). G. lamblia was evident in 16% of stool samples, 11% of duodenal biopsies and 20% of antigen detection by ELISA. Intestinal giardiasis (11%) was associated with chronic inflammatory infiltrate (88.9%), flattening and shorting of villi (66.7%) and duodenitis (22.2%). H. pylori was detected in 43% of cases associated with chronic gastritis (15%), metaplasia (15%), lymphocytic gastritis (14%), erosive gastritis (5%) and atrophic gastritis (4%).

Conclusions: Marked suppression of gastric acid secretion encourages colonization of gastric mucosa by G. lamblia trophozoite especially in the presence of H. pylori, chronic atrophic gastritis, metaplasia or lymphocytic gastritis.

Key Words: H. pylori – Gastric giardiasis – Children – Upper endoscopy.

Introduction

GIARDIA lamblia is the most commonly diagnosed flagellate in the intestinal tract, it colonizes the small intestine of vertebrates causing giardiasis [1]. It is widely distributed apparently more prevalent in children than adult and more common in warm climates than cool ones [2].

The Giardia trophozoites attached to the epithelium of the small intestine by ventral adhesive disc and absorb their nutrients from the lumen of the small intestine [3]. The parasite mostly colonizes the proximal small intestine although a significant proportion of patients may have ileal, colon or stomach infection [4].

Giardia lamblia trophozoite was identified in the gastric biopsy at abnormal circumstances most often associated with H. pylori, chronic atrophic gastritis or intestinal metaplasia. Furthermore, gastric giardiasis can occurs after long-term treatment with antacid drugs especially in patients receiving proton pump inhibitors (PPIs) as a treatment of peptic or duodenal ulcers [5].

H. pylori infection is the most common chronic bacterial infection worldwide [6]. More than 50% of the world's populations are infected with H. pylori which penetrate the mucous lining of the stomach causing chronic gastritis and atrophic gastritis [7].

H. pylori virulence factors aid in colonization of the gastric mucosa and modulate the host im-
mune system stimulating the release of inflammatory cytokines and contributing in the development of malignant complications of infection [8]. Although Helicobacter generally do not invade the mucosa, its attachment to the epithelium leads to an inflammatory reaction with neutrophils, lymphocytes, plasma cells and macrophages infiltration

Gastric colonization with H. pylori can lead to variety of upper gastrointestinal disorders such as chronic gastritis, peptic ulcer and gastric mucosa-associated lymphoid tissue (MALT) lymphoma [9].

The association of gastric giardiasis and H. pylori was the aim of many studies however, the pathological effects of G. lamblia on gastric mucosa are difficult to be evaluated because the histopathological changes were probably attributable to concomitant H. pylori infection [11]. The aim of our work is to detect of gastric giardiasis in children receiving antacid drug and undergoing upper gastrointestinal endoscopy, studying the effect of H.pylori on colonization of gastric mucosa by G.lamblia trophozoites and assessment of the associated histopathological changes of Giardia lamblia and on both duodenal and gastric mucosa and the histopathological changes of H. pylori on gastric mucosa.

Subjects and Methods

The present study was conducted on one hundred children (age range from 1-15 years) of both sexes attending the Endoscopy Unit at Abou El Reish hospital suffering from upper gastrointestinal symptoms in the period from May 2007 to March 2008.

The studied population was classified into 2 main groups: Group I includes 70 dyspeptic patients receiving antacid drugs of proton pump inhibitors (PPIs) category for more than one month. Group II includes 30 patients performing diagnostic endoscopy and not receiving antacid drugs. The indication of performing upper endoscopy among group II included patients with persistent vomiting, epigastric pain, foreign body impaction (FBI) and coeliac disease.

Patients receiving antacid drugs for more than one month to assure decreasing of gastric acidity to give the chance for G. lamblia trophozoite to colonize the stomach mucosa [8]. Patients who had received antibiotics for at least one month from processing the endoscopy also were excluded as it may interfere with H. pylori diagnosis.

G.lamblia was diagnosed by parasitological examination of stool samples. Histopathological examination of gastric and duodenal biopsies and Immunological detection of Giardia coproantigen in stool. H.pylori was diagnosed by histopathological examination of stained gastric biopsies.

All patients in group I and II were registered at endoscopy unit and subjected to full history, clinical examination, stool analysis, blood examination, endoscopy and biopsy taking. History taking includes sex, age, clinical symptoms of patients and indication for endoscopy.

Stool samples were collected from all patients included in the study in a sterile clean stool cups labeled with the patient name and date of collection. About 1gm from each sample was taken and placed in Eppendorff tubes to be stored at –20°C for further identification of Giardia coproantigen using direct ELLZTA technique. Sterile biopsy forceps with a cup size of 5x5mm was used to collect biopsy specimens. During endoscopy, patients were evaluated for esophagitis, esophageal varices, gastritis, gastric erosion, duodenitis, duodenal erosion or ulcer. During each endoscopic examination, two biopsies were taken one from gastric antrum (on the greater curvature 4.5cm proximal to the pylorus) and one from the second part of duodenum for detection of G. lamblia trophozoite and H. pylori micro organism.

This part of the work was performed at Pathology Department, Faculty of Medicine, Cairo University. Histopathological examination of endoscopic biopsies was used for diagnosis of G. lamblia trophozoite within gastric and duodenal mucosa and H.pylori microorganism within gastric and duodenal villi. Following biopsy collection, all specimens were processed into paraffin blocks to get 5um thick tissue sections and stained with (I) Haematoxylin & Eosin stain for detection of the histopathological changes in both gastric and duodenal mucosa. (II) Giemsa stain. (III) Masson trichrome stain for identification of H.pylori and G. lamblia trophozoite.

Results

The study was conducted on one hundred patients with child age (ranging from 0 to 15 years) with mean age of 5.39±3.4 of both sexes attending the Endoscopy Unit at Abou El Reish Hospital and suffering from upper gastrointestinal symptoms.
The studied population was classified into 2 main groups group I includes 70 patients receiving antacid drugs and group II includes 30 patients performing endoscopy but not receiving antacid drugs.

There was male sex predilection in both groups in the current study as group I (n=70) consisted of 41 males (58.60%) and 29 females (41.40%) and group II (n=30) consisted of 19 males (63.40%) and 11 females (36.60%). The overall number of males in the present study was 60 (60%) while the female's number was 40 (40%). Difference in sex distribution between the two groups was found to be statistically insignificant (p-value=0.37).

Difference in age groups was found to be statistically insignificant (p-value=0.22). Group I: The age of members of this group ranged from 1-15 years with an arithmetic mean of 5.4±3.4. Group II: The age of members of this group ranged from 0-15 years with an arithmetic mean of 5.2±3.5.

The clinical presentations of patients (n=100) included in the present study were abdominal pain, flatulence, diarrhea, heart burn and vomiting. Abdominal pain constituted the most frequent complain 33% (n=33). The variation in clinical presentation between groups was statistically significant (p-value=0.02). As regard the clinical data in group I, abdominal pain were reported in 42.8% (n=25) of cases in group II abdominal pain 26.6% (n=8) constituted the commonest complain among patients.

Stool examination of members of group I (n=70) revealed 12 cases with Giardia (17.2%) and 58 cases (82.8%) without Giardia detection in stool, while stool samples of group II (n=30) revealed 4 cases (13.3%) with Giardia and 26 cases (86.6%) without Giardia in the stool. The difference in stool examination between group I (n=70) and group II (n=30) was statistically insignificant (p-value = 0.5).

As regard the endoscopic findings, it was found that 58% of cases (n=58) showed normal endoscopy. Distal oesophagitis constituted the most frequent finding in the overall population (20%) (n=20) followed by esophageal varices (14%) (n=14). The variation in endoscopic findings between the groups was statistically significant (p-value = 0.002).

As regard the histopathological examination of all biopsies, gastric giardiasis was observed in 5.7% (n=4) of cases in group I (n=70) while in group II (n=30) G.lamblia trophozoite wasn’t detected in the gastric biopsies of this group (0%). G.lamblia trophozoite appeared as a teardrop shaped adherent to gastric villi. G.lamblia trophozoite was detected in the gastric biopsies of 4 cases in accompany of H.pylori microorganism detection in these patients. Also examination of duodenal biopsies of the same 4 patients showed G.lamblia trophozoite detection within duodenal biopsies. The 4 cases of gastric giardiasis were combined with G.lamblia trophozoite detection in duodenal biopsy of these 4 patients at the same time, H.pylori microorganism also was detected in the same gastric biopsy of these 4 cases of gastric giardiasis. Intestinal giardiasis was recorded in duodenal biopsies of group I (n=70) in 12.8% of cases (n=9) and in group II (n=30) in 6.7% of cases (n=2).

H.pylori microorganism was recorded in the gastric biopsy of both groups as it was detected in group I (n=70) in 50% (n=35) of patients and in group II (n=30) in 26.7% of cases (n=8) in which the H.pylori microorganism was shown deep within gastric gland.

There is predominance of chronic gastritis (75%) (n=3) in +ve cases of gastric giardiasis (n=4) followed by lymphocytic gastritis (50%) (n=2) which appeared forming lymphoid follicles in some cases. Also, metaplasia was recorded in 50% of patients (n=2) while atrophic gastritis was shown in 25% of cases (n=1). Chronic gastritis (15.5%) (n=10) was predominant in –ve cases of gastric giardiasis in group I followed by metaplasia (13.6%) (n=9), lymphocytic gastritis (10.6%) (n=7), atrophic gastritis (6%) (n=4) and erosive gastritis (1.5%) (n=1). Dysplasia and malignancies were not detected in both +ve and –ve cases of gastric giardiasis in group I. Intestinal giardiasis was recorded in duodenal biopsies of group I (n=70) in 12.8% of cases (n=9). Chronic inflammatory infiltrate (88.9%) (n=8) was the most common pathological finding in +ve cases followed by flatting and shorting of villi (66.7%) (n=6). Duodenitis was reported in 22.2% of cases (n=2) while dysplasia and malignancy were not reported in the +ve cases of intestinal giardiasis in group I.

H.pylori had occurred in 50% (n=35) of patients in group I (n=70) and 26.7% (n=8) of patients in group II (n=30) associated with gastric giardiasis in 5.7% (n=4) of cases in group I (n=70). Chronic gastritis 15% (n=15) and metaplasia 15% (n=15) were common findings in the overall cases of H.pylori followed by lymphocytic gastritis 14% (n=14), erosive gastritis (5%, n=5) and atrophic gastritis (4%, n=4). H.pylori was seen deep in the
lumen of gastric villi as a rod shape structure and associated with metaplasia in 14.3% of cases (n=10). Lymphocytic gastritis (12.8%, n=9) also chronic gastritis (12.8%, n=9) occurred followed by atrophic gastritis (5.7%, n=4) and erosive gastritis (1.4%, n=1).

H. pylori had occurred in 26.7% (n=8) of cases in group II (n=30). H. pylori was associated with chronic gastritis in 20% (n=6) of cases while lymphocytic gastritis in 16.7% (n=5) of cases, also metaplasia accompanied 16.7% (n=5) of cases. Erosive gastritis was reported in 13.3% (n=4) however atrophic gastritis wasn’t reported in group II.

The range of ELISA readings in group I (n=70) was from 0.04 to 0.56 with a mean of 0.117±0.095. ELISA was positive for Giardia antigen in 15 cases (21.4%) in this group while in group II (n=30) the range of readings was from 0.037 to 0.45 with a mean of 0.134±0.115 and the number of positive cases in group II was 5 (16.7%). The difference in ELISA results between groups was statistically significant (p-value=0.003).

In the present study Giardia was diagnosed by parasitological examination of stool samples, histopathological examination of gastric and duodenal biopsies and detection of coproantigen in stool using ELISA technique. Among the one hundred patients 20% (n=20) were +ve for Giardia by ELISA technique, 16% (n=16) were +ve by stool examination and 11% (n=11) of cases were +ve by histopathological examination. As regard stool examination, all +ve cases of Giardia by stool examination (n=16) were +ve by ELISA technique. The differences in Giardia positivity by stool examination and coproantigen detection by ELISA were statistically significant (p-value=0.003).

As regard histopathological examination, all +ve cases of Giardia by histopathology (n=11) were +ve by ELISA technique. A statistically significant difference was found when comparing the results of coproantigen detection by ELISA in relation to the result of histopathology (p-value=0.04).

Fig. (1): A) Gastric giardiasis showing Giardia trophozites (tear drop shaped) by Giemsa stain (Oil immersion X1000). B) Giardia trophozites in between duodenal villi in a case of intestinal giardiasis by Trichrome stain (Oil immersion X1000). C) Helicobacter pylori microorganism along the luminal surface of the gastric glands as rod shaped structure by Giemsa stain (Oil immersion X1000). D) Helicobacter pylori microorganism whin the lumen of the gastric gland by H&E stain (Oil immersion X1000).
Helicobacter pylori is a gram-negative bacillus responsible for one of the most common infections found in humans worldwide [16]. Over 50% of the world population is infected with H. pylori which plays an important role in the pathogenesis of peptic ulcer and gastric cancer [17]. H. pylori creates a state of hypochlorhydra by the help of the virulence factors which permits G. lamblia trophozoite to live in the gastric environment [18]. The coinfections of G. lamblia and H. pylori were reported by [19,20] who reported that, both infections coexisted in 75% of epigastric pain cases. Reynaert et al. (2005) [8] suggested that the extensive use of drugs that abolish gastric acidity like proton pump inhibitors is of crucial importance for the growth of Giardia in the stomach.

In the present study, as regard sex distribution in the studied population, males compromised 60% and females 40% of population. The variation in sex distribution was found to be statistically insignificant (p-value=0.37). Our result comes in agreement with [21] who reported that male sex predominance was found among his studied group. On the contrary, [22] stated that, the incidence of giardiasis is equal among males and females.

The age of patients in the current study ranged from 1-15 years with a mean age of 5.39 years ± 3.4. The variation in age distribution in the studied population was found to be statistically insignificant (p-value=0.22). This comes in agreement with [23] who found that the mean age among his studied population was 5 years. On the contrary, a study in Yemen by [24] to detect that giardiasis is commonly seen in children aged 4-12 years in developing countries. These differences may be related to differences in the geographical distribution or socioeconomic levels among studied populations in different studies.

As regard clinical presentation of patients in the present study, abdominal pain (33%) constituted the most frequent complain followed by flatulence (14%). The variation in clinical presentation between groups was statistically significant (p-value =0.02). These findings comes in consistent with what mentioned by [21] who reported that, all his patients were complaining of dyspepsia, epigastric pain and abdominal distension. On the other hand, [25]reported that giardiasis is a self limited illness and most of infections are asymptomatic. Moreover [26]stated that giardiasis may be clinically unsuspected as patients may complain of vague upper gastrointestinal symptoms.

In the present study, stool examination of members of group I (n=70) revealed 12 cases with Giardia (17.2%) and 58 cases (82.8%) without Giardia detection in stool while stool samples of group II (n=30) revealed 4 cases (13.3%) with Giardia in stool and 26 cases (86.6%) without Giardia detection in stool. The variation in stool examination between group I and group II was statistically significant (p-value=0.003). This means that at least two independently collected stool specimens needed to detect that giardiasis is commonly seen in children aged 4-12 years in developing countries. These differences may be related to differences in the geographical distribution or socioeconomic levels among studied populations in different studies.

| Table (1): Detection of G.lamblia and H.pylori in all examined biopsies. |
|---|---|---|---|---|---|
| Group I | Group II | Total |
| n=70 | n=30 | n=100 |
| No. | % | No. | % | No. | % |
| Gastric G.lamblia | 4 | 5.7 | 0 | 0 | 4 | 4 |
| Intestinal G.lamblia | 9 | 12.8 | 2 | 6.7 | 11 | 11 |
| H.pylori | 35 | 50 | 8 | 26.7 | 43 | 43 |

| Table (2): Results of Giardia diagnostic tests. |
|---|---|---|
| Diagnostic test | Group I | Group II |
| | No. | % | No. | % |
| Stool examination | 12 | 17.2 | 4 | 13.3 |
| Histopathology | 9 | 12.8 | 2 | 6.7 |
| ELISA | 15 | 21.4 | 5 | 16.7 |

| Table (3): Detection of Giardia coproantigen in stool using ELISA technique in group I and II. |
|---|---|---|---|---|---|
| Elisa Results | Group I | Group II | Total | p value |
| | No. | % | No. | % | No. | % |
| Positive | 15 | 21.4 | 5 | 16.7 | 20 | 20 | 0.003 |
| Negative | 55 | 78.6 | 25 | 83.3 | 80 | 80 |

**Discussion**

Giardia lamblia is a flagellated cosmopolitan opportunistic parasite with worldwide distribution [12]. It is the most common isolated protozoan from human gastrointestinal tract [13]. Giardia is found in the upper part of small intestine mainly attached to the mucosa of duodenum and jejunum and has a direct life cycle [14]. Most of studies reported the presence of G.lamblia in stomach under abnormal circumstances most often associated with chronic gastritis, intestinal metaplasia and H. pylori [15].
to be submitted for stool examination to obtain a diagnostic sensitivity of greater than 90% [14] but, in our study collection of more than one stool sample is more or less not feasible from patients attending endoscopy unit at Abou El Reish Hospital.

As regard the endoscopic findings, it was found that 58% of cases showed normal endoscopy. Distal oesophagitis constituted the most frequent finding in the studied population (20%), followed by esophageal varices (14%). The variation in endoscopic findings between the groups was statistically significant (p-value=0.002). The percent of cases with normal endoscopy in our results (58%) was lower than what mentioned by [29] who reported normal endoscopy in 81.5% of his cases. Our results were compatible with that of [21] who elucidated that distal oesophagitis (13.3%) constituted the most frequent finding followed by esophageal varices (6.6%). On the contrary the results by [30] indicated a high incidence of endoscopic duodenitis in patients with giardiasis.

In the current study, the histopathological examination of gastric biopsies revealed that, Giardia lamblia trophozoite was significantly detected in (5.7%) of cases combined with H.pylori in (group I), while in (group II) gastric giardiasis wasn’t detected. These results come in agreement with [26,31] who reported that, (20%) who taking antacid drugs as a treatment for duodenal ulcer showed gastric giardiasis with H.pylori infection. Similarity, [32] reported in a study performed that (10%) of cases showed G. lamblia trophozoites in stomach combined with H. pylori detection in all cases. On the contrary, the association of gastric giardiasis and H. pylori in the study by [21] was (17%) much lower than our result. These variabilities may be attributed to differences in the geographical distribution of H.pylori microorganism or sensitivity of the detected methods.

In the present study gastric giardiasis occurred on top of intestinal giardiasis as the duodenal biopsies of the 4 patients of gastric giardiasis showed G.lamblia trophozoit. This was supported by [19] who reported that under abnormal circumstances most probably with decreased gastric acidity, gastric giardiasis can occur in concomitance with intestinal giardiasis.

As regard the histopathological examination of positive cases of gastric giardiasis, chronic gastritis was predominant in (75%) of cases followed by lymphocytic gastritis in (50%) metaplasia (50%) and atrophic gastritis (25%). This was compatible with that of [19] who found that, gastric giardiasis (14%) more encountered in cases with chronic gastritis than in cases with giardiasis alone (5%). Moreover, at Feltre City Hospital [33] had reported that, intestinal metaplasia (87%) and associated H.pylori (90%) were detected in patients with gastric giardiasis. On the contrary, the case report by [34] had demonstrated a 20 years old woman presented with dyspepsia and the histopathological examination of the gastric mucosa showed Giardia lamblia trophozoites but with no evidence of atrophic gastritis, intestinal metaplasia or H. pylori. However, [33] previously, concluded that there is a close association between gastric giardiasis and chronic atrophic gastritis. Anyway, significant gastric lesions usually more predominant in patients with combined H.pylori infection and gastric giardiasis than those suffering only G. lamblia [35].

In the present study, the pathogenic effects of Giardia lamblia on the stomach were difficult to be evaluated as mentioned by [36] and not specific [37]. This may be attributed to the combined infection with H.pylori microorganism which coexists in all cases of gastric giardiasis (n=4).

In the present study, G. lamblia trophozoite was detected in duodenal biopsies of (11%) of cases and in stool samples of (16%) of cases. These results come in agreement with [38] who stated that, upper endoscopy and biopsy has been suggested to be less sensitive (21 % sensitivity) for the diagnosis of giardiasis when compared to stool examinations. Also, [39] who stated that, the approach of routine duodenal biopsy don’t support diagnosis of giardiasis as compared to stool examinations. On the contrary [29] previously mentioned that, the inclusion of routine duodenal biopsies as a part of upper endoscopy in pediatric patients should be considered favorably in diagnosis of Giardia.

Our results revealed that, all the confirmed histopathological cases (11%) of intestinal giardiasis were confirmed by direct examination of stool samples and antigen detection using ELISA technique. However there are additional (5 cases) positive for Giardia was confirmed by stool analysis and ELISA technique but not confirmed by histopathology. Another (4 cases) were confirmed for Giardia only by ELISA technique but not confirmed by stool analysis or histopathology. The low positivity of Giardia detection by histopathological examination of stained duodenal biopsies may be attributed to the following:

- Site of biopsy: The trophozoite of Giardia lamblia was found either among the mucous threads adherent to the mucous membrane or close to
the membrane itself in the tissue sections [40]. Our duodenal biopsies were taken mostly from the second part of duodenum and this comes in agreement with [39,41].

- Number of taken biopsies: As the histological changes induced by G. lamblia are not specific, more than duodenal biopsy specimens might be needed for detection of the trophozoites [37]. This was confirmed by [26] who found that, the first biopsy in his studied group was negative for G. lamblia but the second and the third biopsies were positive. Moreover [30] stated that multiple duodenal and gastric biopsies were needed to confirm Giardia infection.

- Using immunohistochemical staining: Diagnosis of giardiasis is performed by microscopic examination of stool samples or duodenal biopsies but further methods include immunocromatography and immunofluorescence techniques provide additional tools in diagnosis [26].

Moussa et al. [21] used antiserum containing monoclonal antibody and Meyer’s haematoxylin stain yielding brown stain of the parasite which gives proper localization of the parasite.

In the present study we demonstrated that, chronic inflammatory infiltrate (88.9%), flattening and shortening of villi (66.7%) and duodenitis (22.2%) were the most pathological findings, however dysplasia and malignancy were not reported. This was in accordance with [42] who reported the occurrence of villous flattening (41%) and inflammatory infiltrate (37.5%) in Giardia positive specimens.

In the present study H. pylori was detected in (50%) of patients in (group I) and (26.7%) of patients in group II associated with gastric giardiasis in (5.7%) of cases in group I (n=70). H. pylori was associated with chronic gastritis (15%), metaplasia (15%), lymphocytic gastritis (14%), erosive gastritis (5%) and atrophic gastritis (4%). Dysplasia and malignancy were not reported in the studied population. Our findings come in agreement with [21] who reported that, H. pylori (66.6%) and G. lamblia trophozoite (40%) were detected in patients receiving antacid drugs. On the contrary [31] concluded that there is a close association between gastric giardiasis and chronic gastritis caused by H. pylori.

Using enzyme immunoassay in diagnosis of Giardia carries the advantages of screening numerous samples in the same time [43]. Also, antigen detection reduces the number of patients in which multiple stool samples have to be examined to detect G. lamblia infection [44].

Among the one hundred patients included in the present study (20%) were positive for Giardia using ELISA technique and (80%) were negative. Among the positive 20 cases confirmed by ELISA, stool examination was positive in 16% and missed in (4%) of cases while Giardia detection by examination of duodenal biopsies was positive in (11%) of cases and missed in (9%) of cases. All positive cases of Giardia by stool examination were positive by ELISA technique with statistical significant difference in Giardia positivity by stool examination and coproantigen detection by ELISA. All positive cases of Giardia by histopathology (n=11) were positive by ELISA technique with statistical significant difference (p-value= 0.04) between ELISA technique and histopathology.

Garcia & Garcia [43] reported a sensitivity of (97.2%) and a specificity of (100%) for coproantigen detection by ELISA using a monoclonal antibody. On the contrary, [44] reported that, ELISA sensitivity was (88%) and specificity was (97%) and the false-positive rates by ELISA was ranged from (3%) to (12%) with significant statistical association when compared to microscopic examination of stool. The differences between results of different studies may be dependent on the epidemiology of the infection in the study subjects.

The demonstration of the actual capability of G. lamblia to colonize the gastric mucosa might stimulate further investigations aimed at better defining the interactions between human and this most common parasite.

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