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ROLE OF GIARDIASIS IN CHRONIC RECURRENT ABDOMINAL PAIN IN SCHOOL CHILDREN IN DAKAHLIA GOVERNORATE

By

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ABSTRACT

Background: Chronic and recurrent abdominal pain is a common symptom in children with prevalence ranging between 10% and 20%. Community and school based studies reported that recurrent abdominal pain occurred in 7% to 25% of school-aged children and was severe enough to affect activities in 21 % of them. Chronic abdominal pain includes organic and nonorganic causes. Among organic causes is Giardia Lamblia which is the most important protozoan causing recurrent abdominal pain.

Objective: Detection of the frequency of giardiasis in school children in Dakahlia Governorate with chronic recurrent abdominal pain using routine stools analysis and stools ELISA test for giardia antigen .

Patients and methods: The present study was carried out on 200 school children (primary, preparatory and secondary schools), aged 7-18 years, from Dakahlia Governorate during the period from February 2016 to October 2016. School children chosen complained from chronic abdominal pain and one or more of the cumulative symptoms that support giardiasis like diarrhea, inefficient defecation ,vomiting, ,weight loss and generalized fatigue.

Each child enrolled in the study was submitted thorough clinical examination, blood sample for complete blood count , and stool sample for microscopic stool analysis, and ELISA test for detection of giardia antigen.

Anthropometric measurements (Height, weight and determination of nutritional status) were detected.

Results : Routine stool analysis showed giardia cysts in 50%of the examined stool samples . ELISA detected the giardia antigen in 90% of the examined stool samples. Regarding validity of stool analysis in relation to Giardia antigen by ELISA ,the sensitivity and specificity was 55.5% and 100% respectively . The stool analysis agreed with ELISA antigen detection for giardiasis by 60%.

Conclusion: Giardia Lamblia infection is a causative factor of the recurrent abdominal pain in children. Also, ELISA test for detection of Giardia Lamblia antigen in stool is more sensitive than ordinary stool microscopical examination for diagnosis of giardiasis.

INTRODUCTION

Giardia lamblia (G. lamblia) is a cosmopolitan parasite with a worldwide distribution, and the most common protozoon isolated from gastrointestinal tract **(Fort , 2009 and Freitas, 2012)**.

Giardia alternates between two different forms: a hardy, dormant cyst that contaminates water or food, and an active

disease causing form called trophozoite that emerges after the parasite is ingested **(Langeland, 2014).**

It is a parasite of the small intestine occurring endemically in certain areas and one of the causes of waterborne outbreaks. The parasite is commonly found in children in developing countries and travelers to endemic regions. It causes infections varying from asymptomatic to protracted and severe illness **(Hanevik & Dizar, 2009 and Hawrelak, 2013)**.

The clinical aspects of giardiasis are largely nonspecific, the most common symptoms are diarrhea, abdominal pain, bloating, flatulence and weight loss resulting from malabsorption **(Berger 2007 and Giacometti 2013).** These symptoms may overlap those of patients with other gastrointestinal disorders **(Caccio and Ryan, 2008).** Irritable bowel syndrome (IBS) is a diagnosis of exclusion. The Rome criteria specify three months of abdominal discomfort, unrelated to a physiological or biological cause, which can be associated with bloating ,constipation, diarrhea or mucous. These symptoms also overlap with many other gastrointestinal illnesses, such as inflammatory bowel disease, lactose intolerance, gastrointestinal cancers and parasitic diseases including giardiasiswhich also can become chronic **(Rogers, 2014)**.

By definition, patients with IBS do not have a physiological cause for their illness, but some studies have shown that a significant number of patients who have been given the diagnosis of IBS proved to have infection with *G. lamblia* (**Devanarayana, 2008**). Further evidence for a possible relation between parasitic infections and IBS is that treatment with metronidazole which is an anti-parasitic medication has been shown to decrease symptoms of IBS (**Gieteling, 2007 and Bankston, 2013**). Other authors have described a syndrome of post-infectious IBS (PI-IBS) due to either bacterial or parasitic etiologies **(Graham 2014).** Giardiasis is potentially successfully managed using nutritional interventions which should be considered the first-line approach due to the increased risk of drug side effects and the possible emergence of drug resistance **(Taylor, 2014).**

The aim of the present study was to detect the frequency of giardiasis in school children in Dakahlia Governorate with chronic recurrent abdominal pain using routine stools analysis and stools ELISA test for giardia antigen.

PATIENTS AND METHODS

The present study was carried out on 200 school children of both sexes from primary, preparatory and secondary schools, aged 7-18 years, from Dakahlia Governorate during the period from February 2016 to October 2016.

Inclusion criteria :

1. Age: 7-18 years.
2. School children subjected to this study having chronic abdominal pain or discomfort and one or more of the cumulative symptoms that support Giardiasis: diarrhea, inefficient defecation, nausea, anorexia, vomiting, weight loss and generalized fatigue.

Exclusion criteria :

1. Age: < 7 or >18 years old.
2. Acute abdominal pain (medical or surgical).

3. Children with urinary symptoms as dysuria and frequency or urgency.
4. There was an exclusion of the so-called **'alarm indicators'**, signs suggesting that severe organic disease as progressive severe symptoms, persistent diarrhea, bleeding, persistent vomiting or significant weight loss (loss of >10% of weight through 3 months).
5. History of drug intake in the last 10 days especially non-steroidal anti-inflammatory drugs, antibiotics like ampicillin and its derivatives.
6. Children with any evident chronic disease known to be associated with abdominal pain, e.g. diabetes mellitus, sickle cell anemia, T.B., etc.

Each child enrolled in the study was submitted to the following:

1.Questionnaire after verbal consent (form appended).
2. Thorough clinical examination.
3. Blood sample for complete blood count.
4. Stool sample for:
   - Microscopic stool analysis for consistency, color, odor, presence of food particles, blood, mucous, ova and parasit.
   - ELISA test for detection of giardia antigen.
5. Anthropometric measurements: Height, weight and determination of nutritional status.

Statistical Analysis: Data were analyzed with statistical package **SPSS** version 16 (statistics Package for the Social Sciences). Qualitative data were described using number and percent. Association between categorical variables was tested using **Chi-square test**. Data were considered significant when $p<0.05$.

RESULTS

This study included 200 school children 99 males (49.5%) and 101 females (50.5%) complaining from chronic abdominal pain. Their ages ranged from 7 to18 years (mean 11.85±4.0). Their weight ranged from 20 to 61 kg (mean 47.56±12.02). Their height ranged from 110 to 167 cm mean) 143.08±17.15). Their BMI ranged from 17.44-24.78 (mean 22.24±2.78) **(Table 1)**.

Table (1): General characteristics data of the studied group.

Study group (n=200) / Items	No	%
Sex		
Male	99	49.5
Female	101	50.5
Age		
Mean ± SD	11.85±4.0	
Min-Max	7.00-18.00	
Weight		
Mean ± SD	47.56±12.02	
Min-Max	20.00-61.00	
Height		
Mean ± SD	143.08±17.15	
Min-Max	110.00-167.00	
BMI		
Mean ± SD	22.24±2.48	
Min-Max	17.44-24.78	

The majority of the examined cases (80%) had abdominal pain less than 6 months in duration and the majority of them (65%) complained from abdominal distension **(Table 2)**.

Table (2): Gastro-intestinal manifestations among the studied group.

Study groups (n=200) / Items	No	%
Diarrhea		
Yes	50	25.0
No	150	75.0
Urgency		
Yes	50	25.0
No	150	75.0
Incomplete evacuation		
Yes	29	14.5
No	171	85.5
Anorexia		
Yes	37	18.5
No	163	81.5
Vomiting		
Yes	31	15.5
No	169	84.5
Duration of abdominal pain		
<6	160	80.0
>6	40	20.0
Distension		
Yes	130	65.0
No	70	35.0

Among the 200 school children the mean level of hemoglobin was (10.37± 1.03) Regarding routine stool examination we found that routine stool analysis detected giardia cysts in (50%) of the examined samples **(Table 3)**.

Table (3): Blood picture and Stool analysis findings among the studied group.

Study group (n=200) / Items	*Mean ± SD*	
HB (g/dl)	10.37±1.03	
RBCs (10^6/mm^3)	4.6±0.34	
Platelets (10^3/mm^3)	325.1±63.34	
WBCs (10^3/mm^3)	5977.5±1456.5	
Consistency		
Formed	188	94.0
Semi formed	12	6.0
Color		
Brownish color	200	100.0
Odor		
Offensive odor	200	100.0
Food particles	200	100.0
Mucos		
Positive	10	5.0
Negative	190	95.0
Parasites		
Giardia	80	40.0
Giardia + other parasites	20	10.0
other parasites	100	50.0

ELISA detected giardia antigen in (90%) of the examined stool samples **(Table 4)**.

Table (4): Detection of Giardia antigen by ELISA among the studied group.

Study group (n=200) / Giardia Ag by ELISA	(N=200)	%
Positive	180	90.0
Negative	20	10.0

As regard the validity of routine stool analysis in relation to Giardia antigen by ELISA we found that the sensitivity, specificity and agreement was (55.5%, 100% and 60%) respectively **(Table 5)**.

Table (5) Validity of stool analysis in relation to Giardia antigen by ELISA.

Sensitivity	specificity	Agreement
55.5%	100%	60%

As regard Characteristics of abdominal pain among the studied group we found that the majority of ELIZA positive cases (94.4%) had periumblical pain and (44.4%) of them had severe abdominal pain **(Table 6).**

Table (6): Characteristics of abdominal pain among the studied group

Groups / Items	ELISA positive (n=180)		ELISA negative (n=20)		p-value
	No	%	No	%	
Site					
Periumbilical	170	94.4	20	100.0	X^2= 1.17 p= 0.279
Epigastric	10	5.6	0	0.0	
Duration					
<6m	145	80.5	15	75.0	X^2=0.347 p=0.556
>6m	35	19.5	5	25.0	
Severity					
Mild	30	16.7	5	25.0	X^2=2.87 p=0.238
Moderate	70	38.9	10	50.0	
Sever	80	44.4	5	25.0	

The majority of the ELISA positive cases (69.4%) had abdominal distension and only 25% of the ELISA negative cases had abdominal distension and the majority of the ELISA positive children (72.2%) were with normal nutritional status, 16.7% were wasted, and 11.11% were stunted, while none of the ELISA negative patients were stunted or wasted **(Table 7)**.

Table (7): The prevalence of distension and nutritional status among the studied group

Groups / Items	ELISA positive (n=180)		ELISA negative (n=20)		p-value
	No	%	No	%	
Distension					
Positive	125	69.4	5	25	X^2= 15.62 p=<0.001**
Negative	55	30.6	15	75	
Nutritional status	**ELISA positive (n=180)**		**ELISA negative (n=20)**		**p-value**
	No	%	No	%	
Normal	130	72.2	20	100.0	X^2=7.41 p=.0.025*
Stunted	20	11.11	0	0.0	
Wasted	30	16.7	0	0.0	

Out of the 200 school children examined we found that the majority of ELISA positive patients (55.5%) were from 7 to 12 years, while 44.5% were from 13-18 years. All of the ELISA negative patients were from 13-18 years , Female sex was more common among ELISA positive patients (52.2%).

Hemoglobin level among the examined cases showed that the majority of the ELISA positive patients (71.1%) had HB level less than 10g\dl.**(Table 8)**.

Table (8) Age groups, gender distribution and HB level among the studied cases

Groups / Paramters	ELISA positive (n=180)		ELISA negative (n=20)		p-value
	No	%	No	%	
7-12y	100	55.5	0	0.0	X^2= 22.22 p=<.001**
13-18 y	80	44.5	20	100.0	
Male	86	47.8	13	65.0	X^2=2.13 p=0.144
Female	94	52.2	7	35.5	
HB					
≤10	128	71.1	5	25.0	X^2= 17.18 p=<0.001**
>10	52	28.9	15	75.0	

DISCUSSION

Chronic and recurrent abdominal pain are common symptoms in children with prevalence ranging between 10% and 20%. It accounted for 7%to 25% among school aged children, and sometimes it was severe enough to affect activity in 21 % of them. It constitutes a serious diagnostic and therapeutic problem in childhood **(Wyllie, 2008).** Chronic or

recurrent abdominal pain (RAP) are due to organic and nonorganic (functional) causes. Among the organic causes, protozoal infections mainly giardia lamblia are being reported as the most common cause accounted for about 33% **(Memon et aI., 2009)**.

There are many methods for diagnosis of giardiasis. Among these are microscopic stool examination, microscopic examination of duodenal or jejunal fluid aspirate, small bowel biopsy, and detection of giardia antigen in stool by ELISA or PCR **(Nash, 2014) . E**LISA is a new immunologic test which is capable of detecting small quantities of fecal parasitic antigens, even in mild infections. This antigen is present in the cysts and trophozoites of Giardia lamblia and is very specific to this parasite. ELISA is a simple, sensitive and specific test that can be applied in epidemiological studies for detection of Giardia lamblia coproantigen **(Strand et al., 2008)**.

The sensitivity of ELISA for detection of giardia antigen varies from 85 to 98 % and its specificity ranges from90 to 100 % **(Mayer, 2013)**.The female sex were more frequent among the ELISA positive cases (52.2%), and this was not uncommon as girls are probably affected by recurrent abdominal pain more often than boys **(Murray, 2013).**

The majority of ELISA positive cases (55.5%) were from 7 to 12 years. This may be due to that this age is the age of school entry and acquiring infection is so easy due to overcrowdness, sharing a common bathrooms, and may eat or drink contaminated water or foods with bad hygiene that will predispose to transmission of infection **(Ford 2007)**.

72.2% of the ELISA positive cases were with normal nutritional status,16.7% were wasted, and 11.11% were stunted , while no one was wasted or stunted among ELISA negative cases . This is likely because of the relation between giardia lamblia infection and anthropometric indicators of malnutrition among school children , significantly associated with low height for age (stunting) and low weight for height (wasting) **(Nematian et al., 2008) .**

The majority of ELISA positive cases showed that71.1% have Hb level less than 10 g/dl which may be due to parasitic infestation especially giardia lamblia, may interfere with iron absorption among the infected cases**(Marz, 2012).** Routine stool analysis detected giardia cysts in 50% of the examined samples while ELISA test detected giardia lamblia antigen in 90% of the examined samples.This was expected because the recurrent abdominal pain is caused by protozoal infections mainly giardia lamblia **(Posserud, 2011).**

As regard the sensitivity and specificity of routine stool analysis for giardia in relation to stool ELISA for giardia antigen among cases, we found that; the routine stool analysis sensitivity was (55.5%) and specificity was (100%) . **(Memon et aI., 2009).** From these results, single stool analysis was not reliable for detection of giardia infection because it has false negative results. This was due to erratic excretion of the parasite in the stool **(Prins, 2012).** On the other hand, stool analysis agreed with ELISA antigen detection for giardiasis by60%. This was because ELISA test was capable of

detecting small quantities of fecal parasite antigens even in mild infection **(Smith, 2013).**

CONCLUSIONS

1. Recurrent abdominal pain appeared to be a common problem among school aged children.

2. Giardia Lamblia infection was a causative factor of the recurrent abdominal pain in children.

3. ELISA test for detection of Giardia Lamblia antigen in stool was more sensitive than ordinary stool microscopical examination for diagnosis of giardiasis.

4. Single stool analysis has a large negative results and can not exclude giardiasis.

RECOMMENDATIONS

1. In every child complaining of recurrent abdominal pain, parasitic infections and mainly the Giardia Lamblia should be put on the top of differential diagnosis.

2. Use of ELISA detection of Giardia antigen in stool for diagnosis of Giardiasis because it is safe, easy, sensitive, reliable, accurate, and non invasive.

3. Single stool analysis should not be used for diagnosis of giardiasis except in epidemiological situations.

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دور الجيارديا في آلام البطن المزمنة المتكررة في أطفال المدارس بمحافظة الدقهلية

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خلفية البحث: تعتبر آلام البطن المتكررة عرضا شائعا في الاطفال بمعدل يتراوح بين ١٠ ، ٢٠ % . وقد سجلت الدراسات القائمة علي المجتمع و المدرسة أن آلام البطن المتكررة تحدث في ٧ % الي ٢٥% من الاطفال في عمر المدرسة ، و كانت شديدة بالقدر الكافي لتؤ ثر في أنشطة ٢١% منهم . يستخدم الاطفال اللذين يعانون من آلام البطن المتكررة الخدمات الطبية باستمرار ، وهي تمثل مشكلة تشخيصية وعلاجية خطيرة في مرحلة الطفولة ، ولهذه الآلام أسباب عضوية وغير عضوية ، ويعتبر طفيل الجيارديا لامبليا من أهم هذه الأسباب العضوية المسببة لآلام البطن المتكررة .

الهدف من البحث : الي دراسة معدل الاصابة بطفيل الجيارديا في أطفال المدارس المصابيين بآلام البطن المزمنة والمتكررة في محافظة الدقهلية باستخدام تحليل البراز و تحليل الدلائل المناعية للكشف عن مولد المضاد الخاص بالجيارديا.

المرضي وطرق البحث : أجريت هذه الدراسة على ٢٠٠ طفل من أطفال المدارس (الابتدائية والإعدادية والثانوية) الذين تتراوح أعمارهم بين ٧-١٨ عاما، من محافظة الدقهلية في الفترة من فبراير ٢٠١٦ إلى أكتوبر ٢٠١٦. و أطفال المدارس الذين تم اختيارهم لهذه الدراسة وكان لديهم آلام مزمنة في البطن وواحدة أو أكثر من الأعراض التراكمية التي تدعم الجيارديا مثل الاسهال ، التغوط غير الكفئ ، والقيء، وفقدان الوزن والتعب المعمم.

وقد خضع كل طفل من المسجلين في هذه الدراسة إلى الفحص السريري الدقيق,وعينة من الدم لتعداد الدم الكامل, وعينة البراز لتحليل البراز المجهري و تحليل الدلائل المناعية للكشف عن مولد المضاد الخاص بالجيارديا .

كما تم قياس الطول و الوزن و تحديد الحالة الغذائية.

نتائج البحث: كشف تحليل البراز وجود الأكياس الحويصلية للجيارديا لامبليا في ٥٠٪ من العينات التي تم فحصها,أما بالنسبة للدلائل المناعية قد اكتشف مولد المضاد الخاص بالجيارديا في ٩٠٪ من الحالات التي تم فحصها.و بالنسبة لحساسية و خصوصية تحليل البراز للكشف عن الجيارديا بالنسبة لدلائل المناعة لمولد المضاد للجيارديا بين حالات الفحص وجد أن تحليل البراز خاص بنسبة ١٠٠٪ و حساس بنسبة ٥٥،٥٪ . أما بالنسبة للتوافق بين تحليل البراز للكشف عن الجيارديا و تحليل الدلائل المناعية بالبراز للكشف عن مولد المضاد للجيارديا بين حالات الفحص وجد أن التوافق كان بنسبة ٦٠٪.

الاستنتاج : في كل طفل يشكو من آلام متكرر في البطن لابد أن نضع العدوي بالطفيليات و خاصة الجيارديا لامبيا علي رأس قائمة أسباب آلام البطن المتكررة. كما أن إستعمال الدلائل المناعية للكشف عن مولد المضاد للجيارديا في البراز لتشخيص الجيارديا آمن و سهل و حساس ودقيق . كما أنه لا يجب إستعمال تحليل البراز مرة واحدة فقط لتشخيص الاصابة بالجيارديا إلا في الحالات الوبائية .