

## Brief Original Article

# ***G. lamblia* and *H. pylori* infections among mentally challenged individuals in rehabilitation centers in Alexandria, Egypt**

Faika I Hassanein<sup>1</sup>, Amany I Shehata<sup>2</sup>, Rashad Abdul-Ghani<sup>3,4</sup>

<sup>1</sup> Department of Microbiology and Immunology, Faculty of Pharmacy and Drug Manufacturing, Pharos University, Alexandria, Egypt

<sup>2</sup> Department of Tropical Health, High Institute of Public Health, Alexandria University, Alexandria, Egypt

<sup>3</sup> Department of Parasitology, Faculty of Medicine and Health Sciences, Sana'a University, Sana'a, Yemen

<sup>4</sup> Tropical Disease Research Center, Faculty of Medicine and Health Sciences, University of Science and Technology, Sana'a, Yemen

### Abstract

**Introduction:** Concomitant infections with pathogens are common, particularly when there are shared modes of infection or when one pathogen promotes the other. Residence among closed-type care institutions may pose an additional risk of such infections. Mentally challenged patients in rehabilitation centers constitute one of the special needs groups exposed to parasitic infections, including giardiasis. Several studies reported concomitant infection with *G. lamblia* and *H. pylori* worldwide and in Egypt; however, the co-existence of these two pathogens among mentally challenged individuals remains unexplored. The present study aimed to study the prevalence and association between *G. lamblia* and *H. pylori* among mentally challenged patients in rehabilitation centers in Alexandria, Egypt.

**Methodology:** 200 individuals admitted to four mental rehabilitation centers in the period from June 2013 to January 2014, who guardians gave informed consent, were recruited. Stool samples were collected and subjected to trichrome stain for *G. lamblia* and to antigen detection for *H. pylori*.

**Results:** The overall prevalence rates of *G. lamblia* and *H. pylori* were 8.5% and 24.0%, respectively. Mono-infection rates were 5.5% for *G. lamblia* and 21.0% for *H. pylori*, while concomitant infection with both species was detected in only 3.0% of cases. However, individuals who were *H. pylori*-positive were about two times more likely to be infected with *G. lamblia* than those who were *H. pylori*-negative (12.5% vs. 7.2%).

**Conclusions:** Mentally challenged individuals in Alexandria harbouring *H. pylori* are about two times more likely to be exposed to *G. lamblia*. Large-scale studies are recommended to confirm this association.

**Key words:** *Giardia lamblia*; *Helicobacter pylori*; concomitant infection; mentally challenged; Alexandria.

*J Infect Dev Ctries* 2017; 11(7):577-582. doi:10.3855/jidc.8783

(Received 17 May 2016 – Accepted 09 November 2016)

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### Introduction

*Giardia lamblia* is a flagellate protozoan parasite that lives in the duodenum and upper jejunum of humans and other vertebrates and can cause gastroenteritis [1,2]. The annual incidence of human giardiasis is estimated to be about 280 million cases worldwide [3,4]. In 2004, it was included in the Neglected Diseases Initiative of the World Health Organization [5]. *Helicobacter pylori* is a flagellate Gram-negative spiral bacterium that can cause gastritis, peptic ulcer of the stomach and duodenum, as well as gastric carcinoma [6-9]. Several recent studies have shown the association between both types of infections from different parts of the world [10-13]. *H. pylori* causes hypochlorhydria by producing large amounts of

urease that converts urea into ammonia and by controlling gastric acid secretion [14,15]. Gastric giardiasis, due to *G. lamblia* colonization of mucosa, with *H. pylori* co-infection is well documented [16-19]. These have been recently reported as an unexpected gastroscopic finding in a case of gastro-gastric fistula [20].

*H. pylori* is known for its intrafamilial clustering [21-24] and is associated with crowded conditions [25,26]. Its high prevalence among institutionalized mentally challenged individuals implies the possibility of its person-to-person transmission [22,27]. In Egypt, concomitant infection with *G. lamblia* and *H. pylori* was reported in a number of studies [28-30]. However, the picture remains unexplored and vague regarding the

co-existence of these two pathogens and their possible association among mentally challenged individuals in Egypt. Therefore, the aim of the present work was to study the prevalence and association between *G. lamblia* and *H. pylori* among the mentally challenged individuals at rehabilitation centers in Alexandria, Egypt, either as residents or visitors seeking care.

**Methodology**

*Study design, setting, and ethical clearance*

An institution-based, cross-sectional study was conducted among mentally challenged individuals admitted to four mental rehabilitation centers in Alexandria, Egypt, during the period from June 2013 to January 2014. The study was approved by the ethics committee of the High Institute of Public Health, Alexandria University, Egypt.

*Sample collection and examination*

A total of 200 individuals (122 males and 78 females) who were admitted to the centers during the study period and who gave informed consent (or whose guardian[s] did), were recruited in the present study. Stool samples were collected in clean plastic containers. Thin smears were prepared from fecal concentrates and stained with trichrome stain for *G. lamblia* [31], and stools were investigated for *H. pylori* antigen using an Ecotest *H. pylori* Antigen kit (Assure Tech, Hangzhou, China) according to the manufacturer's instructions. Data about the patients' gender, age, residence and socioeconomic status were retrieved from their records.

*Statistical analysis*

Data were entered, verified, and analyzed using SPSS version 16.0 (IBM, Armonk, USA). Differences and associations were tested using Pearson's Chi-squared or Fisher's exact test, whichever suitable, and were considered statistically significant at p values < 0.05. In addition, odds ratio (OR) with its corresponding 95% confidence interval (CI) was calculated to identify the possible predictors of infection or association.

**Table 1.** Characteristics of the mentally challenged patients included in the present study.

Variable	Frequency (%)
<b>Gender</b>	
Male	122 (61.0)
Female	78 (39.0)
<b>Age (years)</b>	
Median ± IQR	15± 11
Range	1.5–30
< 15	92 (46.0)
≥ 15	108 (54.0)
<b>Residence</b>	
Urban	126 (63.0)
Suburban/rural	74 (37.0)
<b>Institutionalization status</b>	
Yes	164 (82.0)
No	36 (18.0)
<b>Socioeconomic level*</b>	
Low	118 (73.3)
Moderate	36 (22.4)
High	7 (4.3)

IQR: interquartile range; \* There are 39 cases for which the socioeconomic levels are missing.

**Results**

*Characteristics of the study population*

Of the 200 mentally challenged subjects included in the present study, 61.0% were males while 39.0% were females, with a median age of 15 ± 11 years (range: 1.5–30 years). The majority of the mentally challenged individuals were residents of urban areas (63.0%), institutionalized within rehabilitation centers (82.0%), and of a low socioeconomic level (73.3%) (Table 1).

*Association of H. pylori positivity with G. lamblia infection among mentally challenged individuals*

Of the 200 examined mentally challenged individuals, the overall prevalence rates of *G. lamblia* and *H. pylori* were 8.5% and 24.0%, respectively. *G. lamblia* and *H. pylori* mono-infections were prevalent among 5.5% and 21.0% of them, respectively, while concomitant infection with both species was detected in 3.0% of cases. No statistically significant association was found between *H. pylori* and *G. lamblia* (OR = 1.83, 95% CI = 0.64–5.25, p = 0.372), though those

**Table 2.** Association of *H. pylori* with *G. lamblia* infection among mentally challenged patients in Alexandria, Egypt (2013–2014).

<i>H. pylori</i> positivity	<i>G. lamblia</i> infection, n (%)		Total	OR (95% CI)	P value
	Yes	No			
Positive	6 (3.0)	42 (21.0)	48 (24.0)	1.83 (0.64–5.25)	0.372
Negative	11 (5.5)	141 (70.5)	152 (76.0)		
<b>Total</b>	<b>17 (8.5)</b>	<b>183 (91.5)</b>	<b>200 (100.0)</b>		

OR: odds ratio; CI: confidence interval.

with *H. pylori* positivity were about two times more likely to be infected with *G. lamblia* than were *H. pylori*-negative individuals (12.5% vs. 7.2%) (Table 2).

*Distribution of G. lamblia and H. pylori infections among the mentally challenged individuals based on certain sociodemographic characteristics*

Although males showed a higher *G. lamblia* infection rate than females (11.5% vs. 3.8%), the difference was not statistically significant. Table 3 shows insignificant differences between *G. lamblia* prevalence rates among the studied group with respect to age, residence, hospitalization status and socioeconomic level.

Regarding *H. pylori*, higher infection rates were recorded for females than males, for children younger than 15 years of age and for non-institutionalized individuals than for residents (26.9% vs. 22.1%, 26.1% vs. 22.2%, and 27.8% vs. 23.2%, respectively), but the differences between these rates were not statistically significant. On the other hand, a statistically significant difference between *H. pylori* infection rates was found based on patients’ residence and socioeconomic levels, where those residing in suburban or rural areas and having a low socioeconomic level showed higher infection rates (Table 3).

**Discussion**

Interaction between protozoa and bacteria in mixed infections is common and may lead to an increase or decrease in the burden of either pathogen or both [32]. In the present study, *G. lamblia* showed an

unexpectedly lower overall prevalence rate (8.5%; 17/200) than *H. pylori* (24.0%; 48/200) among the mentally challenged individuals attending or residing in rehabilitation centers in Alexandria [13]. The prevalence of *G. lamblia* in the present study is comparable to those reported among institutionalized Thai and Iranian mentally handicapped individuals [33-35]. However, a lower *G. lamblia* prevalence rate of 2.3% (3/133) has been recently reported among institutionalized mentally retarded individuals in southern Iran [36]. It is noteworthy that the prevalence rate of *G. lamblia* among the mentally challenged is lower than the recently reported rate among pre-school Egyptian children between 2 and 6 years of age (14.8%) in El-Behera, a governorate adjacent to Alexandria [37].

The prevalence of *H. pylori* antigen positivity (24.0%) among the mentally challenged individuals in the present study is lower than the antigen positivity rate (69.4%) recently reported by Sabah *et al.* [30] among adult patients with gastrointestinal parasites attending the outpatient clinic of a medical department in Tanta city, Egypt. However, it is comparable to *H. pylori* antigen prevalence rate (21.0%; 87/414) reported among asymptomatic Lebanese children [38]. The lower *H. pylori* rate among mentally challenged individuals compared to that in the general population is in disagreement with the conclusion drawn from a review by Kitchens *et al.* [39], who concluded that intellectually and developmentally disabled individuals exhibit *H. pylori* infection two times higher than those of the general population. In contrast to our study, a

**Table 3.** Distribution of *G. lamblia* and *H. pylori* infections based on the sociodemographic characteristics of mentally challenged patients in Alexandria, Egypt (2013–2014).

Variable	N	<i>G. lamblia</i> n (%)	OR (95% CI)	P value	<i>H. pylori</i> n (%)	OR (95% CI)	P value
<b>Gender</b>							
Male	122	14 (11.5)	3.24 (0.90–11.6)	0.070	27 (22.1)	0.77 (0.39–1.49)	0.498
Female	78	3 (3.8)			21 (26.9)		
<b>Age (years)</b>							
<15	92	8 (8.7)	1.05 (0.38–2.83)	0.927	24 (26.1)	1.24 (0.64–2.36)	0.524
≥15	108	9 (8.3)			24 (22.2)		
<b>Residence</b>							
Urban	126	13 (10.3)	2.01 (0.63–6.42)	0.237	23 (18.3)	2.28 (1.18–4.42)	0.014
Suburban/rural	74	4 (5.4)			25 (33.8)		
<b>Institutionalization</b>							
Yes	164	14 (8.5)	1.03 (0.27–3.77)	1.000	38 (23.2)	0.78 (0.34–1.77)	.527
No	36	3 (8.3)			10 (27.8)		
<b>Socioeconomic level*</b>							
Low	118	10 (8.5)	-----	0.866	36 (30.5)	-----	0.003
Moderate	36	3 (8.3)			2 (5.6)		
High	7	1 (14.3)			0 (0.0)		

N: number examined; n: number positive; OR: odds ratio; CI: confidence interval; \* There are 39 cases for which the socioeconomic levels are missing.

higher *H. pylori* seroprevalence rate of 54.6% (41/75) was reported among institutionalized Iranian patients with Down syndrome and mental retardation compared to controls [40]. Nevertheless, it should be noted that the latter study adopted a different diagnostic approach, measuring serum antibodies against *H. pylori*.

In the present study, only 3.0% of mentally challenged individuals showed concomitant *G. lamblia* and *H. pylori* infections. Although the mentally challenged individuals positive for *H. pylori* antigen in their stools showed about a twofold higher risk of being concomitantly infected with *G. lamblia* than negative individuals, the difference between *G. lamblia* mono- and concomitant infections was not statistically significant. Many studies reported *H. pylori* as a risk factor significantly associated with concomitant *G. lamblia* infection among children from Brazil [10], Turkey [11], Portugal [41], and Uganda [13]. The asymptomatic nature of the study population in the present study may account for the low number of concomitant infections. It is noteworthy that Sabet *et al.* [19] reported concomitant *G. lamblia* and *H. pylori* infections among 33% of Egyptian patients with gastric giardiasis by polymerase chain reaction. Shared fecal-oral modes of transmission may account for their co-existence. In this context, Moreira *et al.* [10] reported that the presence of *G. lamblia* in stool was associated with *H. pylori* seropositivity among Brazilian children, suggesting a fecal-oral route of transmission.

Male mentally challenged individuals were about three times more likely to be infected with *G. lamblia* than were females (11.5% vs. 3.8%); however, the difference was not statistically different. On the other hand, comparable infection rates with *H. pylori* were observed among male and female individuals (21.1% vs. 26.9%). The present study reveals that institutionalization within rehabilitation centers is not a predictor for *G. lamblia* or *H. pylori* among mentally challenged individuals in Alexandria, Egypt. Our finding is in line with Lizza *et al.* [42], who reported that *H. pylori* is highly prevalent among mentally challenged children, irrespective of their institutionalization status. In contrast, Wallace *et al.* [43] reported that past or current institutionalization of intellectually disabled adults is an environmental risk factor associated with *H. pylori* infection.

Low socioeconomic level and residing in suburban or rural areas were the factors significantly associated with *H. pylori* infection among the mentally challenged individuals in the present study. The *H. pylori* infection rate among those residing in suburban/rural areas was higher than that of those residing in urban areas (33.8%

vs. 18.3%). In addition, compared to the absence of *H. pylori* infection among mentally disabled individuals from families with high socioeconomic levels and its low rate (5.6%) among those from a moderate socioeconomic level, 30.5% of individuals of low socioeconomic level were found to be infected with *H. pylori*. This is consistent with a previous study reporting that living in socially deprived, crowded conditions is a risk factor associated with *H. pylori* infection among Egyptian children and adults [44]. Low socioeconomic level and/or living in rural areas are major determinants of high *H. pylori* prevalence in different eastern Mediterranean countries [38,45-47]. The present study was conducted within a time frame of eight months and included all the mentally challenged individuals who agreed (or whose guardian[s] agreed for them) to participate. Therefore, it represents a preliminary study that lays the groundwork for large-scale research studies.

## Conclusions

The majority of *G. lamblia* and *H. pylori* infections among mentally challenged individuals exist as mono-infections. However, those with *H. pylori* are about two times more likely to be exposed to infection with *G. lamblia* than are those without *H. pylori*, though the difference did not reach statistical significance. Predictors of *H. pylori* infection among mentally challenged individuals in Alexandria include residence in suburban/rural areas and low socioeconomic level, whereas none of the tested sociodemographic characteristics were associated with *G. lamblia*. Large-scale studies covering more Egyptian governorates are recommended to confirm the results of the primary findings of the present study.

## Acknowledgements

The authors thank the administration and staff of the four mental rehabilitation centers in Alexandria for their cooperation while conducting the study. Thanks are also extended to the mentally challenged individuals and their guardians for agreeing to participate in the study.

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**Corresponding author**

Dr. Faika I. Hassanein, DrPHSc  
Lecturer of Microbiology and Immunology  
Department of Microbiology and Immunology  
Faculty of Pharmacy and Drug Manufacturing  
Pharos University, Canal El-Mahmoudia Street, Smouha, P.O.  
11111  
Alexandria, Egypt  
Phone.: +20 01005731194  
Fax: +(203) 3877932  
Email address: faika.ibrahim@pua.edu.eg

**Conflict of interests:** No conflict of interests is declared.