

## Intestinal Parasitic Infections From Diarrheic Patients In Pre- And During COVID-19 Pandemic

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### Abstract

**Background:** Intestinal parasitic infections remain a serious public health concern worldwide, especially in developing countries. The COVID-19 pandemic has affected people's lifestyles and type of life. As well as, the presence of intestinal parasitic infections is mainly related to the personal hygiene, overcrowding, and environmental sanitation.

**Objective:** This study was detected to evaluate the prevalence of intestinal parasitic infections from diarrheic patients in the pre- and during-COVID-19 pandemic.

**Patients and Methods:** In the study, the parasitological data of 533 patients who applied to AL-Yarmuk Teaching Hospital and some of the Baghdad Medical Centers between January 2019 to December 2021 and whose stool samples were sent to the parasitology laboratory were examined retrospectively.

**Results:** Intestinal parasites were detected in 32(33%) of 96 patients in the pre-COVID-19 period and in 113 (26%) of 437 patients during the COVID-19 period. In the statistical detection, it was found that there was a significant difference between the positivity rate in the pre-COVID-19 period and the positivity rate in the COVID-19 period. The types of parasites, there was a decrease in the rates of pathogenic parasites *Entamoeba histolytica/dispar* and *Giardia lamblia*, but an increase in the rate of *Cryptosporidium* spp. during covid -19

**Conclusions:** The present study showed that the decrease in the spread of intestinal parasites transmitted by human-to-human contact and fecal-oral route during the COVID-19 period. afflicted personal hygiene, sanitation, and health education can be active in decrease parasitic infections in the COVID-19 period.

**Keywords:** Intestinal parasitic infection. Diarrheic patients. Pre- and during COVID-19

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### I. Introduction

Intestinal parasitic infections are a great public health problem, particularly in lower and medium-income states (1). Intestinal parasitic infections morbidities vary between persons, related to the parasitic factors like the load, type, and intensity of intestinal parasites (2,3), and host factors like nutritional status and age. Intestinal parasitic infections are common among school-aged children (4,5). Rareness of soap for washing the hand, sanitation, and safe water are thought to be significant risk factors for infections with intestinal parasites (2). The parasitic infections are abundant and infect millions of person considered cosmopolitan in distribution. However the potential transmission of intestinal parasites in developed zones and temperate land has currently become problematic, particularly in returning travelers, immigrants, and immunocompromised person (1).

The intestinal parasites *Entamoeba histolytica/dispar* and *Giardia lamblia* are highly prevalent and are evaluated to be responsible for about 5010 and 289 million patients with diarrhea each year (6), in other research detected, the distributed of *E. histolytica/dispar* and *G. lamblia* among under five children were 14.09% and 10.03%, respectively (7). These protozoans are mainly prevalence by the fecal-oral route by eating food or drinking water contaminated with the protozoan cysts. The severity of these parasitic infections is higher in developing countries (8).

One of the serious complications related to intestinal protozoan and helminthes infections, is the growth retardation and nutritional effect in children. This complication depends on the type of parasite, co infection with different parasites, the density of parasites and the period of infection. The effect of infections on different people as well as depends on the nutritional status of the individual. Treating protozoan and helminthes diseases can lead to improvements in consequently in growth and nutritional status (2).

Parasitic infections have led to different numbers of diseases from comparatively un hurt to life-threatening complications which detected a great public health problem in different country. However, 30% of the world's individual is at risk of intestinal parasitic infections particularly immunocompromised individuals and the happening has rapidly increased in current years (9).

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), occurred in December 2019 in Wuhan, Hubei Province, China (10),

and quickly be a pandemic health care problem; recently, 192 countries worldwide are detected, containing, as of February 2023, 673 million detected cases and greater than 6 million deaths.

This enveloped RNA virus, distributed by aerosols, direct contact, and droplets, belongs to the betacoronavirus genus and is mainly observed in a SARS-like atypical pneumonia connected with bilateral ground-glass opacity in chest CT scans (11,12,13.). As well as, it can have sever systemic effects, simulating organs like the gastrointestinal tract. COVID-19 was detected in the patients stool, detecting other method of transition and diagnosis (14).

Among patients, gastrointestinal disorders have been observed in 1 to 79% of them, with different sigh containing diarrhea, anorexia, nausea, abdominal pain and vomiting, sometimes occurring before the respiratory sigh (15,16,17). In COVID-19, prolonged gastrointestinal disorders, especially diarrhea, were relationship with decrease richness and diversity of immunological deregulation, enteric microbiota, and late viral riddance.variation researches have detected sever cases of gastric perforation, pancreatitis, and colitis related with COVID-19 disease, although the broad spectrum of complications that may increase (18,19).

However in COVID-19 period, countries have locked their borders, restricted human move even outdoors and banned travel, in order to detect the disease. It is not known whether the measures taken to control the pandemic affect the distributed of intestinal parasitic infections. Since the distribution of intestinal parasitic infections is mainly linked with personal hygiene, overcrowding, and environmental sanitation, (20), the decreasing of intestinal parasitic infections is related to health education. Therefore, due to the regard of personal and social health during the COVID-19 period, This study was detected to evaluate the prevalence of intestinal parasitic infections from diarrheic patients in the pre- and during-COVID-19 pandemic.

## II. Patients And Methods

### 1. Patients and Samples

The study contained patients of different age groups who visited the Parasitology Laboratory in AL-Yarmuk Teaching Hospital and some of the Baghdad Medical Centers due to gastrointestinal complaints with diarrhea. Then, the socio-demographic data of patients and laboratory results were collected from the available data of the Hospital and Center information database. Stool samples were collected between January 2019 to December 2021. In this cross-sectional study, depend on information of the past 3 years in the pre- and during COVID-19 period was used.

### 2. Stool Samples Examinations

**A-Macroscopic examination:** Stool samples were observed in terms of consistency, color, odor and presence of blood and mucus.

**B- Microscopic examination:** Stool smears were examined with normal saline and lugols iodine under the low (x10) and high (x40) powers of the microscope.

### Statistical Analysis

The data analysis was done by Statistical Package for Social Sciences (SPSS) version (21).

## III. Results

During 3 years, 533 fecal samples were collected, including 96 patients pre covid -19 and 437 patients during covid-19 with an age range of 0->18 years suffering from gastrointestinal complaints with diarrhea and then feces examination, resulted in 145 infections out of 533 humans (27%), among whom 32 out of 96 in pre-covid patients (33%), and 113 out of 437 during covid patients (26%) were positive, which mean that there was decrease in the number, the results observed significant difference, ( $p < 0.05$ ) between intestinal parasitic infections in pre-covid -19 and during covid -19 pandemic.as shown in Table 1.

**Table1: Intestinal parasitic infections in pre and during covid-19 pandemic period**

Applied test	Direct microscopy			P-value
	+ve (%)	-ve (%)	Total (%)	
Pre covid-19 pandemic	32(33)	64(67)	96 (100)	p ≤0.05
During covid -19 pandemic	113(26)	324(74)	437(100)	
Total	145(27)	388(73)	533(100)	

In present study, intestinal parasitic infections were detected in the fecal samples of 32 (33%) of 96 patients in the pre COVID-19 period, and 113 (26%) of 437patients during the COVID-19 period. It was observed that the increase in the frequency of intestinal parasites were present in males patients than females and there was also increase in individuals between 0-18 years of age in pre- and during covid-19 period (Table 2).

**Table 2: Association of intestinal parasitic infections with demographic characteristics in pre and during the COVID-19 pandemic period.**

Variable factors	Pre covid -19		During COVID-19	
	Number of patients examined	Positive patients (%)	Number of patients examined	Positive patients (%)
<b>Gender type</b>				
<b>Male</b>	60	21 (35)	237	65 (27)
<b>Female</b>	36	11 (31)	200	48 (24)
<b>Total</b>	96	32 (33)	437	113 (26)
<b>Age groups</b>				
<b>0-18 years</b>	54	19 (35)	250	71 (28)
<b>&gt;18 years</b>	42	13 (31)	187	42 (22)
<b>Total</b>	96	32 (33)	437	113 (26)

Type and frequency of intestinal parasites detected in the patients were given in Table 3. *E. histolytica / dispar* and *G. lamblia* were the highest intestinal parasites that were associated with diarrhea, as well as the study showed that the infections rates of *Entamoeba histolytica/dispar*, *Giardia lamblia* in the pre-covid-19 period ((12(13%)and 8(8%), respectively), were decreased during the covid-19 period (53(12%) and 32(7%) respectively). While the infections rate of the *Cryptosporidium spp.* increase among patients during covid-19 pandemic period 7( 2%) compared to the pre-covid-19 pandemic period 1 (1%).

**Table 3: Type and frequency of intestinal parasites among patients in pre and during The COVID-19 Pandemic period.**

Detected parasites	Pre covid-19(%) (n = 96)	During covid-19 (%) (n = 437)
<i>Single infection</i>		
<i>Entamoeba histolytica/dispar</i>	12 (13)	53 (12)
<i>Giardia lamblia</i>	8 (8)	32 (7)
<i>Chilomastix mesnili</i>	2 (2)	6 (1)
<i>Blastocystis hominis</i>	2 (2)	5 (1)
<i>Balantidium coli</i>	1(1)	2 (0.5)
<i>Cryptosporidium spp.</i>	1 (1)	7 (2)
<i>Dientamoeba fragilis</i>	1 (1)	3 (1)
<i>Taenia spp.</i>	3 (3)	0(0)
<i>Enterobius vermicularies</i>	2 (2)	5(1)
<b>Total</b>	32 (33)	113 (26)
<i>Double infection</i>		
<i>E. histolytica/dispar</i> + <i>E.vermicularies</i>	1 (1)	1 (0.2)
<i>E. histolytica/dispar</i> + <i>Cryptosporidium spp.</i>	1(1)	1 (0.2)
<i>E. histolytica/dispar</i> + <i>G. lamblia</i>	3(3)	2 (0.5)

#### IV. Discussion

Intestinal parasitic infections regard as the main serious causes of diarrhea (22). However, while diarrheal diseases are distributed in different ages, they are usually more intense among children related to their small body size, and quick capacity to become dehydrated (23), four to five million child killing every year in the world (24). Enteric parasites are usually detected in many societies and these parasites still preserve their significant. The occur of enteric parasites differs according to the cleanliness, education level, socioeconomic status, and feed habits of the societies, as well as demographic characteristics of the country and geographical situation (25-30).

In present study, the yearly prevalence demonstrates a high distributed in 2019 in contrast to the later years 2020 and 2021. This submit a reduce in Intestinal Parasitic Infection prevalence during COVID, compatible with identical study conducted by Teimouri et al (31). As well as comparing the present study results by other studies detected in Iran (25) and Saudi Arabia (26) detected reduce in the distribution of enteric parasites during the COVID-19 period, in contrast to the pre-COVID-19 period. The health education and personal hygiene could be functional in decreasing parasitic infections in the COVID-19 period (25). When study the enteric parasites prevalence before and during the covid pandemic, the reduce in distribute during pandemic can be demonstrate by protective and health control done by the local health authority to decrease the prevalence of the covid virus same due time may be due to the reluctance of patients to get medical services in hospitals be afraid from attractive the virus. hand washing daily, travel limitation, and disinfectants used also may play a role in helping reduce ability of attractive the infection (32)

In the present study the parasitic infections were in general higher in children. The causes could be related to the contaminated food and water, and personal hygiene measures, as main of parasites were belonging and they not realize the good sanitation in compare with older ages (33).

Each sexes, males and females in different ages, were risky to chance of infection because all of them were living under the same conditions and climates of infections (23), but the result in present study found that more males were infected than females, this consistent with the results of AL-Kubaisy in Baghdad city (34), and Al-Saeed *et.al* in Dohuk city (35), in which they detected increase parasitic infection in males as contrast with females. This high distribute relation with males could be due to the actuality that male more energetic than females. furthermore, males further contact with environmental conditions and spend further time outside the house and they were more in contact with environmental conditions than females. This make them extra susceptible to infection than females (35).

The present study showed intestinal protozoan infection is major problem in the study. This results agree with the previous studies that applied higher rates of protozoan infections than helminthic infections and mainly suggest this prevalence related to the contaminated water and food (36). With regard to the species of enteric parasitic infections *Entamoeba histolytica/ dispar* was establish to be the predominant enteric parasite 12 (13%) in pre covid while 53 (12%) during covid period followed by *Giardia lamblia* 8 (8%) in pre covid while 32 (7%) during covid period. This result consistent with other studies that *E. histolytica/ dispar* and *Giardia lamblia*, were reported as the dominant enteric parasite regardless differation in the reported magnitude (37,38). Present results also in agreement with other study and meta-analysis which detected these 2 protozoan as common causative agent of enteric infections (39). Moving to the helminthic infections it was detected that *Enterobius vermicularies* was the most common helminth followed by *Taenia spp.* The distribute of the intestinal helminths in the present study was reduce in agreement with last studies (40, 41). The low distribution of *Enterobius vermicularies*. may be related to the improvement social and personal health measures, particularly during the COVID-19 pandemic, while the low prevalence of *Taenia spp.* might be related to the low raw meat eating during COVID-19 pandemic, good latrine coverage in the geographic region, and high shoe wearing practice (42).

At the same time, *Cryptosporidium spp* rate increased during covid -19. The infection with COVID-19 may increase the appearance of this protozoan which related to the reduce of the immune system favoring the increase of opportunistic infection, which is hard to diagnosis due to overlapping of sighs (43).

However, the results of the present study appeared variation between intestinal parasitic infections and the year of research so that the distribution of enteric parasites before the COVID-19 pandemic was higher than during the COVID-19 pandemic. The situation of parasitic infection in every social is reflected the health condition of the social. The reduce distribute rate of intestinal parasitic infections during the COVID-19 pandemic can be related to alter in the lifestyles of persons. During the COVID-19 pandemic, social distancing, hand hygiene, and quarantine were performed to decrease the danger of COVID-19 (44), which may decrease the intestinal parasitic infections as well. The COVID-19 pandemic has also had a huge impact on the number of person indicated to hospitals (45)

## V. Conclusions:

The present study showed that the reduce in the spread of intestinal parasites transmitted by human-to-human contact and fecal-oral route during the COVID-19 period. afflicted personal hygiene, sanitation, and health education can be active in decrease parasitic infections in the COVID-19 period.

## VI. Recommendations:

The control measures, hand hygiene, health education, and lockdown pointed toward COVID-19 disease can reduce the prevalence of enteric parasitic infections. All these results need more studies.

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**Conflict of interest:** nil

### Ethical Statement

This study, was conducted with full adherence to ethical research standards. All data used in the study were collected from reliable sources and were analyzed in a manner that respects privacy and confidentiality. The research aims to enhance public awareness.

No human or animal subjects were directly involved in this research, and no experiments were conducted that might harm individuals or the environment. The study complies with relevant environmental and public health guidelines and regulations.

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