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CASE-CONTROL STUDY OF INTESTINAL PARASITES IN PATIENTS WITH INTESTINAL CANCER IN SOHAG, EGYPT

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Abstract

Significant morbidity and mortality occur in immunocompromised hosts as a result of parasite infections. Cancer patients have impaired immune systems, either due to the illness itself or as a result of immunosuppressive medications or treatments. In this study, parasitic infections in patients with intestinal cancer from Sohag Hospitals and Sohag Oncology Center's Clinical Oncology and Nuclear Medicine department were assessed. Between April and October of 2023, a total of 100 stool samples were taken from outpatient clinics; another 100 stool samples were taken from the healthy control group. Every sample that was gathered was split into three sections: the first was used for microscopic and macroscopic analysis, the second was kept for later use and preservation, and the third was cultivated to identify *Strongyloides stercoralis*. In contrast to 21% (21 instances) in controls, 45% (45 cases) of patients with intestinal cancers (24 with colon cancer and 21 with rectal cancer) had intestinal parasites. According to the data, *Blastocystis hominis* was the most prevalent.

Keywords: *Blastocystis hominis,* cancer, intestinal parasites, and patients.

Introduction

The International Agency for Cancer Research estimated that 16% of cancer worldwide is caused by infectious factors, including zoonotic parasites (Parkin, 2006). These days, cancer ranks among the leading causes of death in many communities across the globe (Cao *et al,* 2021). According to Furman et al. (2019), there has been a rise in cancer risk factors in recent times, including dietary modifications, stress, environmental changes, and certain infections. The immunosuppressive effect of colorectal cancer is direct (Rasti *et al,* 2017). Tumor immune tolerance begins slowly and locally, develops, and eventually spreads to the entire organism due to immune suppression that takes place at both the molecular and cellular levels (Shivaji *et al,* 2019).

The intestinal protozoan infections are more common in immunocompromised hosts, especially when there is reduced or absent T-cell activity (Cohn *et al,* 2022). There are two main types of immune response to parasites: innate immunity, which is seldom able to eradicate the parasite on its own, and adaptive immunity, which is more effective at preventing infection (Zaki *et al,* 2024).

The immune system is essential for preventing and curing parasite infections. The pattern of some parasitic infections has changed due to the current widespread use of immunosuppressive therapy and the increasing number of people with immunocompromised states; as a result, parasitic infections are now more common than diseases caused by any other group of organisms in terms of global morbidity and mortality (Seyrafian *et al,* 2011**).**

This paper aimed to evaluate parasites in patients with intestinal cancers in Sohag Governorate, compare infection levels with the control group, and detect the commonest intestinal parasites affecting them.

Materials and Methods

This study was conducted in a total number of 100 stool samples were collected from the patients with intestinal cancers from the Clinical Oncology and Nuclear Medicine department of Sohag University Hospitals and Sohag Oncology Center and another 100 cancer-free patients as a control group.

from outpatient clinics, over the period from the beginning of April to the end of October 2023. As the case-control present study,

Study design: Medical sheets were filled out on each patient, and control. Fecal samples were collected from enrolled patients. All laboratory procedures were performed in the research laboratory of the Sohag Medical Parasitology Department.

Stool examination: Early morning stool specimens were collected in clean, dry, wide-mouth disposal containers with tight-fitting lids. Cautions were taken to prevent specimen contamination with water or urine. The specimen container was labeled with the patient's name and identification number and the date and time of sample collection.

Each collected sample was divided into three parts; 1st part was examined freshly without preservatives by macroscopic and early wet mount microscopic examination. The consistency of the fecal samples, the presence of blood or mucus, parasites like pinworm rounds or tapeworm segments, and other factors were all macroscopically inspected (Garcia, 2021). The 2nd part was preserved by formalin 10% and sodium acetate-acetic acid-formalin (SAF) for concentration techniques including (formalin ethyl-acetate sedimentation and simple floatation technique), staining with (modified Kiny oun's acid-fast stain) and microscopically examined (El Naggar *et al,* 1999). The 3rd part of the stool specimen was cultivated in agar plate purchased from Hi-Media Egypt Company for the Laboratory Supplies, for *Strongyloides steroralis* diagnosis (Garcia, 2016).

Ethical approval: The study protocol was approved by Scientific Ethical Committee (MREC) in Faculty of Medicine, Sohag University No (Soh-Med-23-04-24MS).

This study was registered at Clinical Trials. gov. with registry No. (NCT05850884). Individa-ul informed consent was obtained from all enrolled patients after explaining the procedure and the study purpose. The study started from the beginning of April 2023to the end of October 2023, as the case-control present study.

Statistical analysis: Data were analysed by SPSS 25 software package and expressed as a percentage. P value<0.05 was considered significant.

Results

The age of cancers patients ranged from 40 to 70 years with a mean (53.42±7.696). Males were 55 (55%) and females were 45 (45%). Of whom 63 were from urban areas and 37 from rural ones. Patients 49 suffered from colon cancer and 51 suffered from rectal cancer. Control was 50 males and 50 females, with ages ranged from 30 to 70 years old.

Cancer patients ages ranged from 40 to 70 years (53.42±7.696), all within age group of 61-70 (P=0.01). Males were (55%) and (63%) of patients live in urban areas.

Thirty (47%) patients from urban areas were more infected with parasites than 15 (40%) in rural areas, but with neither significant differences as to sex nor residency (*P* > 0.05).

Cancer patients with intestinal parasites were 45 cases (45%) of whom 24 (48.98%) cancer colon and 21 (41,18%) rectal cancer cases as compared to 21 cases (21%) in controls, intestinal cancer patients showed high significant differences (P 0.01) the prevalence of intestinal parasites was higher in cancer colon patients than rectal cancer ones

Blastocystis hominis was (37%) followed by *Cryptosporidium* (14%), *E. histolytica* (6%), *G. lamblia* (6%), bacterial *Microsporidia* (6%), *E. coli* (4%), and (1%) for each of *Iodamoeba butchilli* & *E. hartmani*. In controls, *B. hominis* was (13%) followed by *E. histolytica* (4%) and *G. lamblia* (3%) with significant differences between patients and controls as to *B. hominis and Cryptosporidium* (P <0.05).

There was a high marked relation between *B. hominis* and patients with intestinal cancers (*P* =0.001).

Details were given in tables (1, 2, 3 & 4) and figures (1 & 2)

Table 1: Parasites in patients with cancers as to demographic characteristics

Variations	Patients (100)	Infected patients	*P-value*
Ages: 41-50years	40 (40%)	16(40%)	
51-60years	49 (49%)	18(36.7%)	
61-70years	11 (11%)	11(100%)	0.01
Males	55(55%)	26(45.45%)	
Females	45(45%)	19(44.45%)	0. 920%
Residency: Rural	37(37%)	15(40.54%)	
Urban	63(63%)	30(47.62%)	0.492%

Table 2: Total patients each with at least one intestinal parasite.

Variations	Number	Percentage
Parasitic samples	66/200	33%
non-parasitized samples	134/200	67%

Table 3: Intestinal parasites in patients with colon cancer and/or rectal cancer with healthy control.

Subjects	Number of patients	Number infected	Percentage	P value
colon cancer patients	49	24	48,98%	0.00
rectal cancer patients	51	21	41,18%	0.01
Total cancer group	100	45	45%	0.01
Healthy control group	100	21	21%	2.43

Table 4: Distribution of parasites among cancer patients and controls.

pathogens	Cancer patients		Control		Significant
	No.	%	No.	%	P-value
Blastocystis hominis	37	37.00	13	13.00	0.001*
Cryptosporidium	14	14.00	0	0.00	0.022*
E. histolytica	6	6.00	4	4.00	0.102
G. lamblia	6	6.00	3	3.00	0.651
Microsporidia	6	6.00	0	0.00	0.325
E. coli	4	4.00	5	5.00	0.640
Iodamoeba Butchilli	1	1.00	0	0.00	0.460
Entameba.hartmani	1	1.00	0	0.00	

Discussion

In the present study, stools examination showed that intestinal parasites in patients with intestinal cancers were 45% (24 colon cancer & 21 rectal cancers) with highly significant (P< 0.005) as compared to controls 21% (21).

In the present study, intestinal parasites in cancer patients was 45/100 (45%) with ages ranged from 40 to 70years (53.42±7.696). Parasites were mainly *Blastocystis hominis* (37%) and *Cryptosporidium* spp. (14%). Other parasites were *E. histolytica* (6%), *G. lamblia* (6%), *Microsporidia* bacteria (6%), *E. coli* (4%), *I. buetschilii* (1%) and *E. hartmani* (1%). The parasites in controls (21%) with ages ranged from 30 to 70 years (45.74±7.21) were *B. hominis* (13%) followed by *E. histolytica* (4%), *G. lamblia* (3%) and the commensal *E. coli* (5%). This result agreed with Ali *et al.* (2022), they reported that blastocystosis was (52%) among CRC and (42%) among (NC) non-cancer ones. Also, Kumarasamy *et al.* (2022a) reported more significant parasitic rate among cancer patients (17%) as compared to the controls (3%). They added that of 195 patients with gastrointestinal malignancies, 26 had *Cryptosporidium* spp. (13.33%), and in non cancer controls.

Generally speaking, *Blastocystis* sp. infection clinical significance remains uncertain, mainly because of its common occurrence in both the dyspeptic patients and healthy persons (Ramirez *et al,* 2014). Thus, the differences in the clinical blastocystosis consequences may depend on the STs different types (Khademvatan *et al,* 2018). The predominance of *Blastocystis* sp. ST3 among the patients with chronic gastrointestinal diseases was reported in Egypt (Hussein *et al,* 2008), in Turkey (Ozyurt *et al,* 2008), in the United States (Jones *et al,* 2009) and others. The colorectal cancer associated with the opportunistic *Blastocystis* sp. infection was an increasing risk even before the oncological treatment (Padukone *et al,* 2017). Besides, Abd El-Latif *et al.* (2023) in Egypt reported that *Cryptosporidium* infection was significantly higher among cancer colon patients

reinforcing to be considered as one of the risk factors for the development cancer colon. Undoubtedly, the apoptosis resistance is one of the hallmarks of the development of cancer (Hanahan and Weinberg, 2011). The Egyptian cancer colon constituted about 6.5% of all cancers as the 6th the most common cases diagnosed (Hassan *et al,* 2021). Moreover, Chen *et al*. (2022) in China reported that the prevalence of *G. lamblia* was high among colorectal cancer patients in Henan Province, and assemblage A is the dominant genotype of *G. lamblia*. Use of septic tanks, daily use of well water and raising livestock are risk factors of the *G. lamblia* infections among patients with colorectal cancer.

In the present study, *Microsporidia* bacteria was (6%) among the cancer patients. This more or less agreed with Noosha- dokht *et al*. (2017), who reported that 10.05% (20/199) suffered from microsporidia infection. Redondo *et al.* (2022) in Spain reported that the high microsporidia prevalence in tissues and the seroprevalence in patients with cancer colon (CC) suggested the relationship between microsporidia as a pathogenesis agent.

In the present study, intestinal parasites in rectal cancer patients (P= 0.61) were in 26 males (47.27%) as compared to 19 females (42.22%). In the control intestinal parasites were in 13 males (26%) as compared to 8 females (16%) without sexes risk factor (P = 0.37). But, Lepczyńska *et al.* (2021) in Poland reported that *Blastocystis* is a common enteric protist that is linked to intestinal and extra-intestinal diseases, with significant differences was found in different age groups, where *Blastocystis* was highly detected in the elderly people. Ali *et al.* (2022) found that *Blastocystis* in 52% CRC patients and 42% non-cancer ones, respectively. Among CRC patients they reported 24 (46.2%) in female patients and 28 (53.8%) male ones without significant relationship as to the sociodemographic variations. This also agreed with Sulżyc-Bielicka *et al.* (2021), who reported a significant difference in *Blastocystis* prevalence among the CRC patients and controls (12.15% & 2.42%, respectively), without correlation between sex and *Blastocystis* infection.

In the present study, *B. hominis* was detected in 29.7%, 25%, & 15% among patients with colorectal cancer (CRC), COGT (cancers beyond gastrointestinal tract), and (NC) controls. This agreed with Mohamed *et al.* (2017), who reported that NC and 138 can-cer patients, 64 of whom were of the COGT patients and 74 of whom were the CRC patients.

In the present study, intestinal cancer patients with intestinal parasites were advanced in ages (P< 0.01), that might be due to immunological suppression of aging along with debility. This agreed with Sulżyc-Bielicka *et al.* (2021), who reported that colon cancer was associated with increased risk of opportunistic *Blastocystis* sp. infection, even the before oncological treatment.

In the present study, residence was not a risk factor for acquiring intestinal parasites in intestinal cancer patients (P=0.326), intestinal parasitic infections were detected in 6 /37 of the controls from urban areas (16.9%) and 15/63 cases from rural ones (46.8%) without risk factor for intestinal parasites (P=0.368). This agreed with Ali *et al.* (2022), who didn't find significant difference among the CRC patients, and their sociodemographic variations.

Conclusion

Immunosuppression is common in patients with colorectal cancer for a variety of reasons, including advanced age and poor nutritional status. Patients with intestinal cancer had a higher incidence of intestinal parasites than people without the disease; at Sohag University Hospital, the infection rate among patients with intestinal cancer was 45%. Intestinal cancer patients had significantly higher prevalence of *B. hominis* and *Cryptosporidium* than did healthy control subjects.

Nevertheless, neither residence nor sex had an impact on this infection rate. Patients with intestinal cancer who were between the ages of 61 and 70 had the highest infection rates, with a high significant difference.

Conflict of interest: Authors declared that

neither have any conflicts of interest nor received any funds.

Authors' Scientific Role: The authors reported that each one equally shared in this study according to her/his specialization and all shared in writing, revising and approved the manuscript publication.

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Explanation of figures

Fig. 1: Comparison between incidences of intestinal parasites in patients and control

Fig. 2: Distribution of parasites in samples (n=200).