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THE RELATIONSHIP BETWEEN ENTAMOEBA HISTOLYTICA AND COLON CANCER

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ABSTRACT

Entamoeba histolytica infections are prevalent in the gastrointestinal tract, particularly in developing regions. While colonic amoebiasis with colon carcinoma is rare, study where Entamoeba trophozoites coexisted with colon cancer. The trophozoites were identified using Periodic acid Schiff (PAS) stain, highlighting their presence. patients received metronidazole treatment, and two underwent subsequent resection followed by adjuvant chemoradiotherapy. Detecting this coinfection is crucial due to the immunocompromised state of cancer patients, many of whom undergo adjuvant chemotherapy and radiotherapy. Neglecting Entamoeba coinfection in such cases could lead to severe complications like dissemination to the brain, liver, lungs, and pericardium. This series underscores the importance of considering parasitic coinfections in colon cancer cases, especially in endemic areas.

INTRODUCTION

Entamoeba histolytica (E. histolytica) is a parasitic protozoan primarily found in the human bowel, existing in two forms: a mobile trophozoite (10 µm to 20 µm long) capable of invading multiple organ systems and a cyst form with prolonged survival that can colonize the intestines. The life cycle of E. histolytica begins with the ingestion of infectious cysts in fecally contaminated food or water. Upon ingestion and passage through the stomach, the organism excysts and appears in the large intestine as an active trophozoite. Trophozoites multiply through simple division and encyst as they progress down the large bowel. **(Chou A et al., 2023)**

Cysts are then excreted in feces and can remain viable in a moist environment for weeks to months. Infections by Entamoeba histolytica lead to amebic colitis, often characterized by cramping abdominal pain and bloody diarrhea. Although most E. histolytica infections are asymptomatic, approximately 10% progress to invasive disease, and about 1% of invasive cases develop extraintestinal disease via the bloodstream, affecting organs like the liver, lungs, pericardium, brain, and skin, potentially causing severe and life-threatening illness. (Choudhuri et al., 2012)

The clinical presentations and endoscopic appearance of colonic amoebiasis can mimic colonic carcinoma. This report describes an exceptionally study demonstrating the colonization of colonic cancers by co-existing E. histolytica and discusses their clinicopathological features. (Moorchung et al., 2014)

Background

Ways of Infection Spread

Fecal-Oral Route

Entamoeba histolytica is primarily transmitted through ingestion of contaminated food or water containing cysts of the parasite.

Poor sanitation practices, such as improper disposal of fecal matter or sewage contamination of water sources, contribute to the spread of the parasite.

Person-to-Person Transmission

Direct contact with infected individuals who shed the parasite in their feces can lead to transmission.

Crowded or unsanitary conditions increase the risk of person-to-person transmission, especially in communities with inadequate hygiene practices.

Food and Water Contamination

Contaminated food items, including raw fruits and vegetables washed or irrigated with contaminated water, can harbor Entamoeba histolytica cysts.

Drinking water from unsafe sources or consuming beverages made with contaminated water can also contribute to infection.

Protection

Hygiene and Sanitation

Promoting good hygiene practices, such as regular handwashing with soap and water, especially before handling food or eating, can reduce the risk of infection.

Ensuring access to clean and safe water sources for drinking and cooking helps prevent contamination-related infections.

Food Safety

Educating individuals about proper food handling, storage, and preparation techniques can minimize the risk of ingesting contaminated food.

Encouraging the consumption of thoroughly cooked foods and avoiding raw or undercooked items can decrease the likelihood of parasite transmission.

Diagnosis

Microscopic Examination

Microscopic examination of stool samples for Entamoeba histolytica trophozoites or cysts is a common diagnostic method.

Stool samples may be concentrated using techniques like formalin-ether sedimentation or zinc sulfate flotation to enhance parasite detection.

Serological Tests

Serological tests, such as enzyme-linked immunosorbent assay (ELISA) for detecting specific antibodies against Entamoeba histolytica, can aid in diagnosis, especially in cases where stool microscopy is inconclusive.

Potential Causes of Association with Colon Cancer

Chronic Inflammation

Entamoeba histolytica infection can lead to chronic inflammation of the colon, which is a known risk factor for the development of colorectal cancer.

Prolonged exposure to inflammatory mediators and reactive oxygen species produced in response to the parasite's presence may contribute to oncogenic processes.

Immune Modulation

The parasite's ability to modulate the host immune response, including altering cytokine profiles and immune cell activity, may influence the development of colorectal cancer.

Immune dysregulation induced by Entamoeba histolytica infection could promote tumor growth and progression in the colon.

Microbiome Alterations

Entamoeba histolytica infection may disrupt the gut microbiome composition, leading to dysbiosis, which has been linked to an increased risk of colorectal cancer.

Changes in microbial diversity and metabolite production in the colon environment could contribute to carcinogenesis in individuals with chronic or recurrent amoebiasis.

METHODOLOGY

This is a cross-sectional study was conducted. Stool samples were collected from 419 patients attending the Gastroenterology and Endoscopy Unit. The diagnosis and patient selection were overseen by a gastroenterologist. Samples were analyzed at the Department of Medical Microbiology. The patients included males and females of varying ages, ranging from 1 year to over 60 years.

Laboratory Investigations

Macroscopic Examination: This involved assessing stool consistency, color, odor, and the presence of blood or mucus.

Microscopic Examination: Direct wet mount smear and Iodine-stained smear were performed as per standard protocols, while the concentration technique (Formal-ether) was also employed.

Fecal Calprotectin Assessment (Quantitative Fecal Calprotectin ELISA Test): An ELISA kit from Epitope Diagnostic Int (EDI) company-USA was used for quantitative measurement of FC in stool samples. The kit utilizes a Sandwich technique with two selected antibodies binding to different epitopes of human calprotectin.

Blood Sample Collection and Processing: Five ml of blood were collected in EDTA tubes for CBC analysis, including total WBC count and neutrophil percentage using an automated hematology machine XP-Sysmex.

Statistical Analysis

Data were expressed as percentages and mean± SE in tables. Variances between study parameters were assessed using the chi-square test and t-student test, with significance set at $P<0.05$ for differences between analyzed parameters.

RESULTS

Table 1: Incidence of Entamoeba histolytica among patients, positive and negative rates.

Total examined	Positive %	Positive No	Negative %	Negative No	P-value
419	24.58	103	75.42	313	<0.05

This table shows the prevalence of Entamoeba histolytica among patients, with a positive rate of 24.58% and a negative rate of 5.42%. The P-value indicates a statistically significant difference between positive and negative cases.

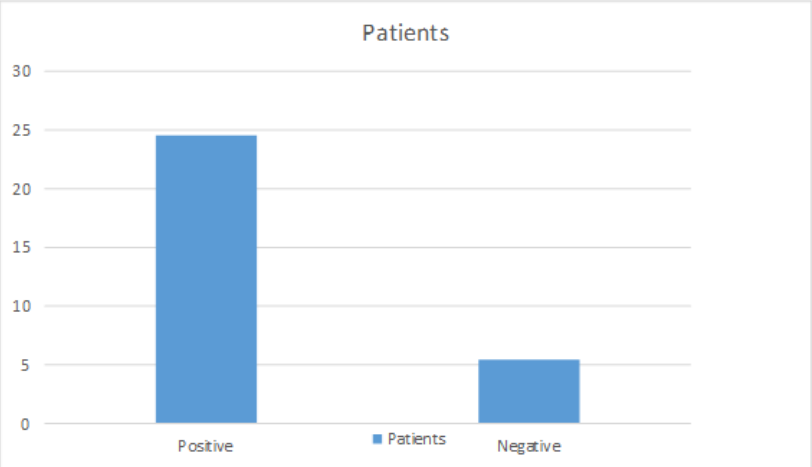

Table 2: Positive and negative rates of stool samples for Entamoeba histolytica according to genders and ages.

Entamoeba histolytica	Males Positive No	Males Negative No	Females Positive No	Females Negative No
Age groups				
1-10	5 (13.51%)	7 (21.21%)	3 (8.57%)	10 (17.54%)
11-20	4 (10.81%)	5 (15.15%)	5 (12.28%)	10 (17.54%)
21-30	8 (21.62%)	6 (18.18%)	8 (22.85%)	9 (15.78%)
31-40	2 (5.40%)	13 (28.25%)	2 (5.71%)	3 (5.26%)
41-50	4 (10.81%)	2 (6.06%)	2 (5.71%)	11 (19.2%)
51-60	6 (16.21%)	7 (21.21%)	9 (25.7%)	6 (10.52%)
61-above	37 (51.28%)	46 (44.66%)	35 (48.61%)	57 (55.33%)
Total				
Total Positive	66		64	
Total Negative	46		54	

This table presents the positive and negative rates of Entamoeba histolytica in stool samples based on gender and age groups. It shows varying rates across different age groups and genders, highlighting potential differences in infection rates.

Table 3: Frequencies of Entamoeba histolytica in relation to cancer positive cases and ages.

Entamoeba histolytica	Total cancer Positive No	Total cancer negative No
Age groups		
1-10	10 (6.89%)	8 (28.57%)
11-20	11 (17.24%)	9 (10.71%)
21-30	3 (10.43%)	6 (21.42%)
31-40	2 (6.89%)	1 (3.57%)
41-50	8 (27.58%)	3 (10.71%)
51-60	6 (20.68%)	1 (3.57%)
61-above	29 (50.87%)	28 (49.13%)
Total		
Total negative patients	59	
Total positive cancer patients	71	

Here, the frequencies of Entamoeba histolytica are compared between cancer-positive and cancer-negative

cases across different age groups. The table indicates a potential association between amoebiasis and certain age groups among cancer-positive patients.

Table 4: Distribution of Entamoeba histolytica according to stool consistency in Relation to patient gender.

Genders	Males Diarrhea/ constipation No	Males Diarrhea/ constipation %	Females Diarrhea/ constipation No	Females Diarrhea/ constipation %
Constipation	3	5.26	4	8.69
Diarrhea	54	94.73	42	91.30

This table illustrates the distribution of Entamoeba histolytica based on stool consistency and patient gender. It shows the proportion of cases with diarrhea or constipation among males and females, providing insights into the clinical presentation of amoebiasis.

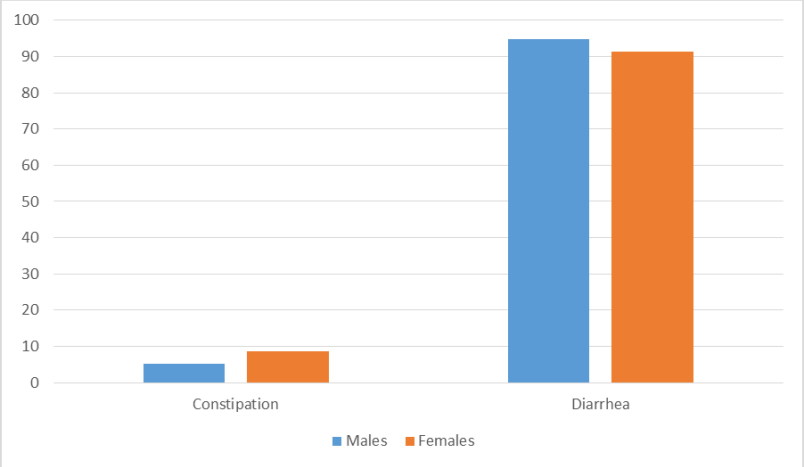

Table 5: Fecal calprotectin levels, mean of total white blood cells count, and neutrophils count among patients with intestinal amoebiasis.

Entamoeba histolytica	Fecal calprotectin FC Mean Males	Fecal calprotectin FC Mean Females	Total Neutrophils Mean Males	Total Neutrophils Mean Females	Total WBC Mean Males	Total WBC Mean Females
>50 ng/ml	32	18	3811.93	7934.18	76.16	64.05
<50 ng/ml	54	25	3738.4	3835	48.21	62.12

This table presents fecal calprotectin levels and mean counts of white blood cells and neutrophils in patients with intestinal amoebiasis. It indicates potential markers of inflammation and immune response in these patients.

Table 6: Determination of Haemoglobin and PCV mean levels among positive for Entamoeba histolytica in regard to patients' gender compared to control.

Types of Gastroenteritis	Total Male	Total Female
Positive cancer patients		
Entamoeba histolytica positive Hb (g/dl)	11.52	11.55
PCV (%)	35.00	34.36
Control group		
Not infected Hb (g/dl)	13.00	12.55
PCV (%)	39.00	37.60

This table compares hemoglobin and packed cell volume (PCV) levels among patients positive for Entamoeba histolytica with controls, based on gender. It provides insights into potential differences in hematological parameters associated with amoebiasis.

DISCUSSION

Entamoeba histolytica (E. histolytica) is a parasitic protozoan causing amoebiasis, prevalent in regions with poor sanitation. It's a significant health concern, with millions of cases annually and notable mortality rates. The majority of infections are asymptomatic, but

invasive disease can occur, especially in immunocompromised individuals. (Lin & Kao, 2013)

Coinfection of E. histolytica with colon cancer is exceptionally rare but critical to recognize due to potential complications, especially in immunocompromised cancer patients undergoing chemotherapy or radiotherapy. Immunocompromised states increase the risk of invasive amoebiasis, including fulminant colitis. (Zhu et al., 2014)

Colon and rectal cancer rates are notable, making the coexistence of amoebiasis and colon cancer an important consideration. While colonic amoebiasis can mimic colon cancer, simultaneous presence is uncommon. Few cases have been reported globally, emphasizing the novelty of this case series. (Grosse, 2016)

The diagnostic challenge lies in differentiating amoebic trophozoites from tumor cells or macrophages. Techniques like Periodic Acid Schiff (PAS) staining and immunohistochemistry aid in accurate identification. Despite challenges, the presence of E. histolytica trophozoites in colonic malignancies, as shown in this series, warrants attention. (Skappak et al., 2014)

Understanding the potential inhibitory effects of colonic adenocarcinoma on E. histolytica adherence could explain the rarity of coexistence. Prompt treatment of amoebiasis, especially in cancer patients, is crucial to prevent complications like fulminant colitis. (Moorchung et al., 2014)

CONCLUSION

This study underscores the importance of considering co-existing amoebiasis in colon cancer patients, particularly those undergoing immunosuppressive treatments. Awareness among clinicians and pathologists is vital for timely diagnosis and management, given the potential risks associated with untreated amoebiasis in immunocompromised individuals.

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