Chandi & Lakhani | Article 9319
J Pure Appl Microbiol. 2024;18(2):1051-1056. doi: 10.22207/JPAM.18.2.20
Received: 22 February 2024 | Accepted: 23 April 2024
Published Online: 13 May 2024

P-ISSN: 0973-7510; E-ISSN: 2581-690X

RESEARCH ARTICLE OPEN ACCESS

Prevalence of Intestinal Parasites among Diabetes Mellitus Patients in Tertiary Care Hospital

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Citation: Chandi DH, Lakhani SJ. Prevalence of Intestinal Parasites among Diabetes Mellitus Patients in Tertiary Care Hospital. *J Pure Appl Microbiol.* 2024;18(2):1051-1056. doi: 10.22207/JPAM.18.2.20

Abstract

Intestinal parasitosis constitutes a serious problem of public health, especially in developing countries. Even though the population of immunocompromised individuals is growing, this is a primary cause of illness and mortality. Numerous studies have demonstrated that immunosuppressive medications, such as those used after transplantation, as well as immune suppression as a primary immunodeficiency in HIV infection, increase the possibility of infection and persistent states of carriage. People whose immune systems were weakened, like in the case of chronic internal disorders or abnormal metabolism, were thought to be more susceptible to infection. A group of metabolic non-communicable diseases known as diabetes mellitus (DM) are characterized by hyperglycemia or elevated blood sugar, which can be brought on by either inadequate secretion of insulin, insulin-resistant cells, or both. Parasitic infections in immunocompromised people are becoming more well-known as major opportunistic microorganisms that cause clinical illnesses. The goal of this research is to see how common intestinal parasite infections are in people with diabetes. The research was carried out at the Chandulal Chandrakar Memorial Medical College, Bhilai, Durg district of Chhattisgarh, India. From March to August 2020, diabetic patients who visited hospitals were studied in this cross-sectional study. This study comprised 188 diabetic individuals with type I or type II diabetes who were taking anti-diabetic medication. With a little spoon and a sterile, dry, leak-proof plastic container with a tight-fitting cover that had the patient's name and identification number on it, the feces samples were taken. The container was then quickly sent to the parasitology lab of the microbiology department for processing. Stool samples were examined under three headings: macroscopic examination, microscopic examination, and formal ether concentration procedure. A total of 188 DM patients was included with data on socio-demographic characteristics, and from each patient stool sample were collected and processed. Out of which, 27 stool samples were positive for intestinal parasites; showed a prevalence of 14.36%. Female 16 (16.49%) revealed a greater frequency than that of men 11 (12.09%). The age range of 51 to 60 years old exhibited the highest incidence 8 (29.63 %). Stool samples were positive for intestinal parasites with one suffering from a dual infection. Various parasites were detected in which *Entamoeba histolytica* 10 (5.32%) was most common parasite to isolate followed by *Ascaris lumbricoides* 9 (4.79%) and *Giardia lamblia* 6 (3.19%) was least isolated parasite. The most prevalent isolated parasite was *Entamoeba histolytica*, which was followed by *Cryptosporidium parvum*. Diabetic patients have an increased risk of parasitic infections, particularly when they have the opportunistic infection *Entamoeba histolytica.* Patients with diabetes who have been diagnosed with *Cryptosporidium parvum* have a weaker immune system. Therefore, for the sake of societal welfare, people with diabetes mellitus should have routine stool examination screening for parasite infection.

Keywords: Diabetes Mellitus, Immunocompromised, Intestinal Parasites, Infection

INTRODUCTION

Intestinal parasitosis constitutes a serious problem of public health, especially in developing countries. Even though the population of immunocompromised individuals is growing, this is a primary cause of illness and mortality.[1] This is frequently regarded as a major health issue on a global scale.[2] Particularly in developing countries like India, where a lack of knowledge about the pollution of food and water supplies causes parasite cycles to lengthen, as well as a lack of hygienic surroundings and health education.[3] Numerous studies have demonstrated that immunosuppressive medications, such as those used after transplantation, as well as immune suppression as a primary immunodeficiency in HIV infection, increase the possibility of infection and persistent states of carriage. People with weakened immune systems—those with chronic internal disorders or abnormal metabolism, for example—were thought to be more vulnerable to infection.[4-6] Immunocompromised patients also include those with chronic renal illness, which results in a progressive and irreversible loss of kidney function and necessitates renal replacement treatment.[7,8] Hyperglycemia, or increased blood sugar, is a hallmark of a set of metabolic non-communicable disorders collectively referred to as diabetes mellitus (DM). This condition can be caused by

either inadequate secretion of insulin, insulin-resistant cells, or both.[9] Type 1 Insulin-Dependent Diabetes Mellitus (IDDM) and Type 2 Non-Insulin-Dependent Diabetes Mellitus (NIDDM) are the two kinds of diabetes mellitus. Polyuria, polydipsia, and polyphagia are the hallmark symptoms of high blood sugar. Diabetes has become one of the most common metabolic disorders worldwide, affecting a wide range of populations and appearing to be on the rise.[10] Eighty percent of diabetes resides in both middle-class and low-class. As per studies, roughly 382 diabetes affects millions of individuals globally, with the figure anticipated to climb to 592 million by 2035 if necessary prevention and management initiatives are not implemented.[11] The study indicates that the world's largest population of diabetes subjects is found in India, earning the undesirable title of "diabetes capital of the world". [12] It has been reported that diabetic people are immunocompromised.[2,13-15] Parasitic infections in immunocompromised people are becoming more well-known as major opportunistic microorganisms that cause clinical illnesses.[16,17]

Aims

The purpose of this study is to determine the prevalence of intestinal parasite infections in individuals in diabetics.

MATERIALS AND METHODS

Place of study

The research was carried out at the Chandulal Chandrakar Memorial Medical College, Bhilai, Durg district of Chhattisgarh, India.

Sample size

From March to August 2020, diabetic patients who visited hospitals were studied in this cross-sectional study. A study was conducted on all Diabetic patients to identify the prevalence of intestinal parasites. This study comprised 188 diabetic individuals with type I or type II diabetes who were taking anti-diabetic medication. Based on an ongoing bigger work of PhD thesis, of which this study is a part, a quantity of samples of 188 was used.

Study design

Over the study period, comprehensive patient data was collected from both the medical record department (MRD) and patients. With a little spoon and a sterile, dry, leak-proof plastic container with a tight-fitting cover that had the patient's name and identification number on it, the feces samples were taken. The container was then quickly sent to the parasitology lab of the microbiology department for processing. For the study, diabetic patients were selected at random.

Stool samples were examined under three headings

Macroscopic examination, microscopic examination, and formal ether concentration procedure.

Macroscopic examination

Blood, mucus, adult worms, tapeworm segments, and larvae were all examined macroscopically in the samples. The color and odor of the stool, as well as its consistency (formed, loose, watery, or soft), were noted.

Microscopic examination

Direct microscopic examination was performed on all faeces samples. Wet mounts in saline and iodine were used to look for parasite cysts, trophozoites, ova, and larvae. Utilizing modified Ziel-Nelseen (MZN) stain, intestinal coccidians as *Isospora belli, Cryptosporidium parvum* and *Cyclospora* were identified.[15]

Concentration technique

The presence of parasites was also examined microscopically using the formal ether concentration method. Treatment was recommended after a positive stool sample revealed the presence of parasites.

RESULTS

In this study, a total of 188 Diabetic patients were included with data on socio-demographic characteristics, and from each patient stool sample were collected and processed.

A total of 188 stool samples were processed from a total 188 Diabetic patients; of them, 27 (14.36%) tested positive for parasites. Table 1 indicates that, of the 188 patients, 91 (48.4%) were female and 97 (51.6%) were male.

Table 1. Prevalence of intestinal parasites among diabetes mellitus patients in Tertiary Care Hospital based on gender

Gender	Number of Diabetic Patients	Percentage (%)
Male	91	48.4
Female	97	51.6
Total	188	100.0

The ratio between male to female was 0.94:1.

The mean age of the Diabetic patients included in this study was 47.55 years old (standard deviation (SD): 11.61), with ages ranging from 20 to 70 years old. There were more people in the 51-60 age group, as seen in Table 2 below. The prevalence of females 16 (16.49%) was higher in this study than that of males 11 (12.09%). The greatest frequency, 8 (29.63%), was seen in the 51–60 age range.

Among the 188 samples, 27 (14.36%) had positive intestinal parasite results, with one sample having a mixed infection. *Ascaris lumbricoides, Giardia lamblia, Entamoeba histolytica,* and *Cryptosporidium parvum* were found as distinct parasites, containing three protozoans and one helminths in which *Entamoeba histolytica* 10 (5.32%) was most common parasite to isolate followed by *Ascaris lumbricoides* 9 (4.79%) and *Giardia lamblia* 6 (3.19%) was least isolated parasite as displayed below in Table 3.

Table 2. Prevalence of intestinal parasites among diabetes mellitus patients in Tertiary Care Hospital based on age

Age	Number of Diabetic Patients	Percentage (%)
21-30	18	9.57
31-40	29	15.43
41-50	53	28.19
51-60	63	33.51
61-70	25	13.30
Total	188	100.00

Table 3. Prevalence of intestinal parasites among diabetes mellitus Patients in Tertiary Care Hospital based on parasitic infection

Parasites isolates	Parasites identified	Percentage (%)
Entamoeba histolytica	10	5.32
Ascaris lumbricoides	9	4.79
Cryptosporidium parvum	6	3.19
Giardia lamblia	2	1.06
Total	27	14.36

Table 4. Number of parasites with single or mixed infection classifications

No. of Infections	Parasitic infection	No. of parasite isolated from Diabetic Patients	Percentage (%)
Single infection	*Entamoeba histolytica*	9	33.33
	Giardia lamblia	2	7.41
	Ascaris lumbricoides	8	29.63
	Cryptosporidium parvum	5	18.52
	Total	24	88.89
Multiple infections	*Entamoeba histolytica* & *Cryptosporidium parvum*	3	11.11
	Total	3	11.11

In this study, patients with diabetes also had mixed and single parasite infections. Three individuals had a mixed infection with *Entamoeba histolytica* and *Cryptosporidium parvum*, while 24 patients had a single infection. Out of 27 isolated single infections 24 (88.89%) were more prevalent than mixed infections 3 (11.11%) as shown in Table 4.

DISCUSSION

Growing rates of diabetes mellitus have become a serious health concern in most emerging nations, contributing to extended illness and premature demise death.[18,19] Globally, the prevalence of parasite infection is rising in Diabetic Patients as a result of aging, urbanization, obesity, physical inactivity, and a host of other variables.[20,21]

A higher proportion of young, middle-aged adults in Asian countries have diabetes mellitus.[22] According to a 2013 study by Kharroubi *et al*.,[23] 382 million people worldwide have diabetes mellitus, accounting for an approximate 8.3% prevalence.

Parasitic infections have been identified as endemic and important sources of disease worldwide. Poverty, illiteracy, bad hygiene, a lack of clean drinking water, and inadequate sanitary health education are all risk factors for parasite infection. These variables may also make infection more likely.[24]

Individuals with diabetes mellitus develop weakened immune systems and are more vulnerable to parasite infections. In patients with impaired immune systems, parasite infections are a significant source of opportunistic pathogens that induce disease.[25]

The incidence a rate of parasite infection in patients with diabetes varies from study to study based on the study population, geographic area, and diagnostic method employed.[26] As opposed to the prevalence observed in other research by Akinbo F *et al*.[10] at 18.7% and Nazligul Y *et al*.[27] at 47%, the prevalence of parasitic infection in Diabetic patients in our study was 14.36%. The prevalence of intestinal parasites among diabetic patients was found to be 10% in a study by Fominyam *et al*.,[28] while a different study by Vaishali *et al*.[25] found less common intestinal parasite infection in diabetics (8.6%) in the northern Indian sub-Himalayan region than the study's findings. While the mean age of 47.55 years was similar to research by Akinbo F *et al*.[10] and Fominyam *et al*.,[28] the greatest age in this study was 51–60 years old. The weakened immune system that age and diabetes mellitus bring about may be the cause of this. In line with other studies carried out by Fominyam *et al*.[28] and Sahar *et al*.,[29] female 16 (16.49%) demonstrated higher than male 11 (12.09%). Perhaps as a result of working in household and agricultural fields, women are more likely to contract intestinal parasites. *Ascaris lumbricoides, Giardia lamblia, Cryptosporidium parvum,* and *Entamoeba histolytica* were identified in the current study from Diabetic patients with parasitic infection, while *Ascaris lumbricoides, Entamoeba histolytica,* and hookworm were the only intestinal parasites commonly found in Diabetic patients, according to a study by Akinbo *et al*.[10] Another study that was conducted by Fominyam *et al*.[28] revealed that *Entamoeba histolytica* 6.7% had a greater prevalence, which was comparable to the findings of this study and distinct from the findings of another study conducted by Nazligul Y *et al*.[27]

CONCLUSION

The study found that 14.36% of Diabetic patients had parasite infection, with females having the highest frequency. The most prevalent isolated parasite was *Entamoeba histolytica,* which was followed by *Cryptosporidium parvum*. Individuals who have diabetes mellitus are more susceptible to parasite infections, especially if they have *Entamoeba histolytica,* an opportunistic infection. Patients with diabetes who have been diagnosed with *Cryptosporidium parvum* have a weaker immune system. Since this might be a primary study, the nation needs to conduct many more studies and research projects. Therefore, for the sake of societal welfare, people with diabetes mellitus should have routine stool examination screening for parasite infection.

ACKNOWLEDGMENTS

The authors are grateful to the SBKS Medical Institute and Research Centre, Piparia, Gujarat, for providing the facilities to complete this work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

Both authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

FUNDING

None.

DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

ETHICS STATEMENT

Not applicable.

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