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INTESTINAL PROTOZOA INCIDENCE AND RISK FACTORS IN MUHAJIR RESIDENTIAL ARC-1&ARC II DISTRICT DIR LOWER

Original Research

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ABSTRACT

Background: *Entamoeba histolytica* and *Giardia lamblia* are protozoa that parasitize the human large intestine, causing significant morbidity and mortality globally, particularly in developing countries. Intestinal protozoan infections are influenced by various factors such as geography, seasonal patterns, hygiene, and nutritional status.

Objective: This study aimed to examine the geographical distribution, seasonal trends, and risk factors associated with intestinal protozoan infections in the Muhajir camps during 2023, while evaluating the impact of public health interventions and infrastructure improvements.

Methods: A total of 576 fecal specimens were collected from participants experiencing diarrheal disease or gastrointestinal illness in the Muhajir camps. The samples were analyzed for the presence of intestinal protozoa, including *Entamoeba histolytica* and *Giardia lamblia*. Data on demographic factors, seasonal trends, and nutritional status were collected and analyzed to identify risk factors and patterns of infection.

Results: The study revealed a significant drop in the transmission of protozoa, particularly diarrhea, compared to previous years. This reduction was attributed to improved water treatment, sanitation facilities, and community awareness campaigns. Seasonal trends showed higher infection rates during summer due to conducive environmental conditions such as temperature and humidity, and lower rates during winter. Males were found to be at higher risk than females, likely due to increased outdoor activities and surface contact. The 20–30 age group exhibited higher infection rates, potentially due to risky practices and frequent environmental exposure. Geographically, Muhajir Camp NP-1 consistently had higher prevalence rates compared to Camp N0-2, emphasizing the need for localized interventions. Nutritional deficiencies, particularly in iron and protein, were associated with increased infection severity.

Conclusion: The findings highlight the importance of targeted public health programs that address seasonal activities, hygiene promotion, and infrastructure development to reduce protozoan transmission. Nutritional interventions aimed at addressing deficiencies in iron and protein could further mitigate infection severity. Sustained efforts to reduce inequalities and address risk factors are essential for achieving steady progress in decreasing protozoan infections and improving health outcomes in vulnerable populations.

Keywords: Intestinal protozoa, *Entamoeba histolytica*, *Giardia lamblia*, seasonal patterns, prevalence dynamics, public health

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INTRODUCTION

One of the Zoology sub-disciplines include Parasitology which deals with host and parasite and types of interrelationships which are parasitic, mutualism, commensalism, and phoresies. Amphixenism is a type of Interaction where one organism simultaneously feeds on or exploits another organism known as the host(1). Most are parasitic and occur in all forms of life and are sub-divided into ectoparasites which feed on external body fluids of the host and endoparasites which feed within the carcass of the host. Parasitic infections have been known for centuries and are still prevalent, especially in the tropic and subtropic world(2, 3). Intestinal Pathogenic Parasites (IPP) adhere to the intestinal mucosa and are the leading cause of gastroenteritis in the world. The consequences of the disease are tremendous; especially in the developing country where kids are most affected. IPP was estimated to impact 3.5 billion people globally with the driving forces of socio-economic status, population density, low hygiene standards, and negligible access to safe water(4). Bacteria that cause IPP are spread through food and water, soil, or meeting infected animals or people; the disease ranges in severity from dysentery to stunting a child's development in the brain. Acute Gastrointestinal Illnesses (AGI), mainly due to IPP have high mortality and morbidity, particularly among children in developing countries. The current global burden of Physical Diseases includes Diarrhea where WHO projects Global deaths of 2.2 million annually diarrheal diseases and of these 20-30% are children under the age of 5 years in Pakistan(5). Morbidity for AGI management is high and continues to be expensive despite advanced economies, attributed to the prolonged infection. These include food/waterborne illness, flood, poor personal hygiene, and congestion. So knowledge of water safety and sanitation is an important means by which the spread of IPP can be managed effectively(6).

Protozoan parasites recur in water, soil, and food and it is believed that environmental contamination is central to the transmission of these diseases. It can be ingested with transmissive stages like cysts or spores, and then make their way into human systems. Transmission is particularly high in regions with poor hygiene standards, and it is anticipated that sixty percent of the world's population in the developing world is at risk(7). Environmental Route of Transmission include host population density, the level of hygiene, socio-economic status, and farming practices. The second means of IPP is contaminated water affecting drinking water sources, food productivity, and water for irrigation. Transmitted water can spread different parasites to other localities and thus infect fresh water as well as seawater. Parasites can also be found in fruits and vegetables that have been contaminated at any time during the process of production, transportation, or preparation for sale and consumption(8). The intricate aquatic web that exists in the water-food chain thus has the fecal material facilitate parasitic transport thus the paranoia. IPP is still a significant problem in South Asian populations, particularly in countries such as Pakistan, India, and Bangladesh. While associated primarily with emergent economies, IPP presents high hazards in developed nations as well(8, 9).

Protozoa are independent, microscopic, and single-celled which are sensitive to several host conditions. They can develop in the host, and numerous species depend on the oral-rectal route, infecting diverse vertebrates and some invertebrates. The parasite Entamoeba histolytica which causes amebiasis affects about fifty million individuals every year as well as 55,000 deaths yearly. It is a protozoan with dimorphic recurring stages: the encysted form that serves as the infectious particle, and the motile, invasive, pathogenic form, known as trophozoites(10, 11). The mode of transmission includes the fecal-oral route and starchy individuals in low-income households who are mostly affected since sanitation is a luxury most cannot afford. Diagnosis methods include microscopy, serology, antigen detection, and PCR. Microscopy alone cannot be used as a yardstick of identification due to confusion between related species. This identifies the E.histolytica through antigen detection most especially the TechLab test methodology as very effective for practical differences between E. histolytica and other similar, harmless species(12, 13). PCR carries high sensitivity and is provided in centers with more resources; however, it is expensive. Conventional treatment of amebiasis is with metronidazole or other nitroimidazole derivatives may be combined with luminal agents like paromomycin targetting the hepatic cysts. Other options for the treatment are available such as nitazoxanide for instance in patients with AMR(14, 15).

Giardia lamblia or Giardia intestinalis is a flagellated protozoan parasite responsible for giardiasis, the third most common cause of diarrheal illness. It infects different models of mammals and is known to be zoonotic which makes it transmissible from animals to man. Giardia is easy to describe in its life cycle having cysts (Clinical) and trophozoite (pathogenic). Food and water are the main routes of transmission and the other is by direct contact with infected animals or their products(16). Giardia infection symptoms range from ranging from relatively mild to more severe conditions such as diarrhea, bloating, and malabsorption. Prolonged in children, the condition may cause growth stunting and learning disabilities. Nitroheterocyclic drugs such as secnidazole and tinidazole are effective treatments since giardia has its peculiar systems of metabolisms. Drug resistance is on the rise, and efforts have therefore been made to identify other forms of treatment(17, 18).

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METHODS

The survey was to be carried out from August 2022 to December 2023 to evaluate the health status and disease patterns in the facilities in the Muhajir camps section. It was carried out in two distinct phases: allowing for two camps: Camp 1 including from August 2022 to January 2023 and Camp 2 including from February 2023 to July 2023. During the implementation of these two camps, 1,388 participants living in the camp communities were surveyed. The data collected was relevant in that it employed a systematic approach to the collection and accumulation of health-related data. The objective was to analyze its seasonal pattern, examine the most relevant health concerns, and offer recommendations on the way this population's needs might be addressed. The research was conducted using quantitative research design specifically cross-sectional where participants were selected from all health sectors in public and private areas across the Muhajir communities(19).

The data collection methodology utilized I have generated Elements of Strategy) interview guide, which should cover a broad spectrum of demographic, clinical, and environmental factors. The questionnaire was subdivided into different categories to make sure that factors that lead to health conditions were comprehensively considered. It started by capturing Patient Demographics which are basic information about a patient for instance name, age, sex, nationality, and address. The clinical data collected was primarily concerned with the number of lesions, their type, location, and the duration of the lesions and as such was valuable for gauging the seriousness of health conditions in the participants. Occupation, travel history, and the family history of diseases were assessed, along with housing attributes such as construction material and vegetation density. Household data gathered info on domestic animals, the clothes one puts on to sleep in, sewage systems, indoor activities and movement, and other regular outdoor activities necessary for analyzing the factors that shape health at large(20).

Clinical, and Household Data Assessment was done in addition to the demography and clinical data collected from the population of Muhajir camps as well as analysis of social and environments that may be a determinant of the diseases in Muhajir camps. This entailed collecting information on the kinds of accommodation; things as walls and ceilings to evaluate their roles in transmitting infections. There was observation of vegetation close to dwelling places since this affects contact with various vectors such as insects. Information concerning occupation and travel history was used to determine relations with diseases imported into the camp. Finally, the information collected from the households gave a better perception of the domestic setting such as the number and type of domestic animals that are carriers of zoonotic diseases, the use of repellents on insects, and the availability of sanitation systems. These ideas helped to gain a concept of general tendencies of health threats in the camps(21).

A significant part of the study entailed evaluating some of the behaviors that may lead to diseases in the community. This included questions on bed cycling, that is, whether the participants slept on the ground or used impregnated bed nets for protection against insect-borne diseases. Insecticides applied and insect repellent used were also documented because they are very useful in minimizing the incidences of vector-borne diseases. Further, data was collected regarding the previous treatment of diseases, which gave an idea of how previous health strategies have been in their practice. Confounding factors were recognized, and all the participants gave their consent to participate in the study. To maintain the study's credibility, the study made sure that all data were collected and handled with anonymity and consistent with the participants' consent, photographic images of lesions were also taken for more precise clinical evaluation(22). In parallel to the survey data, the study This course also contained a laboratory aspect which concentrated on intestinal infections. Stool samples of 576 participants experiencing diarrheal disease or GI illness were also analyzed. These samples were collected in sterile and well-labeled mounts and were preserved in 5% formal solution to reach the laboratory at DHQ Hospital Timergara. Every such sample was initially scrutinized to determine whether there was any form of intestinal parasites or pathogens that could have led to such symptoms. Age, sex, and the season during which samples were collected were also documented to determine differences in infection rates by season and age-sex groups. These laboratory examinations were indispensable in ascertaining the periodicity of infection within the population, and in establishing the correlation between seasonal and demographic variables and infection levels(23).

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RESULTS

This course also had a lab component that focused on our learning of intestinal infections. Stool samples of 576 respondents who had diarrheal disease or GI illness were also tested. These samples were taken in sterile and well-labeled mounts and were accumulated in 5% formal solution to be transported to the laboratory at DHQ Hospital Timergara. Each such sample was first examined to see if there was some form of intestinal parasite or pathogen that might have caused it. Other information that was recorded included age, sex, and

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the period of the year that samples were taken in other to assess differences in infection by season and Age-sex group classifications. These laboratory examinations were most important for determining the periodicity of infection, and for identifying correlations between seasonal and demographic factors and infection rates.

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This course also structured a laboratory component that focused on topics touching on intestinal infections. Fecal Calprotectin of 576 study participants suffering from diarrheal disease or gastrointestinal illness was also tested. All two samples under discussion were collected in sterile and well-labeled mounts moreover, the samples were preserved in 5% formal solution to be transported to the laboratory in DHQ Hospital Timergara. In every such sample, we first sought to assess if there was any form of intestinal parasite or pathogen that could have caused such symptoms. Information about age, sex, and season when samples were collected was also recorded with a view of comparing variations in infection rates by season and age-sex classes. These laboratory investigations were invaluable for determining the cyclical patterns of infection incidence within a population, as well as for underlying the relationships between the seasonal and demographic characteristics and infection rates.

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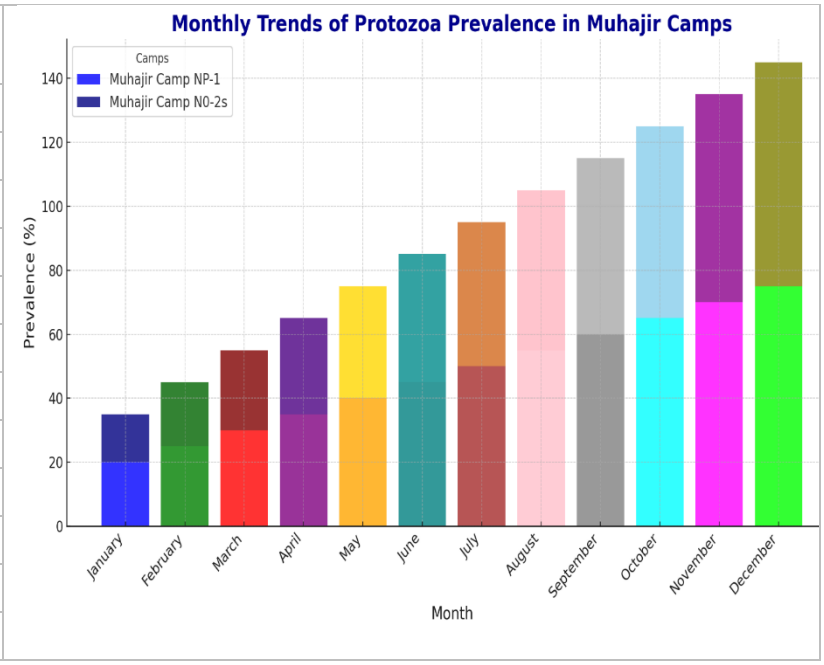
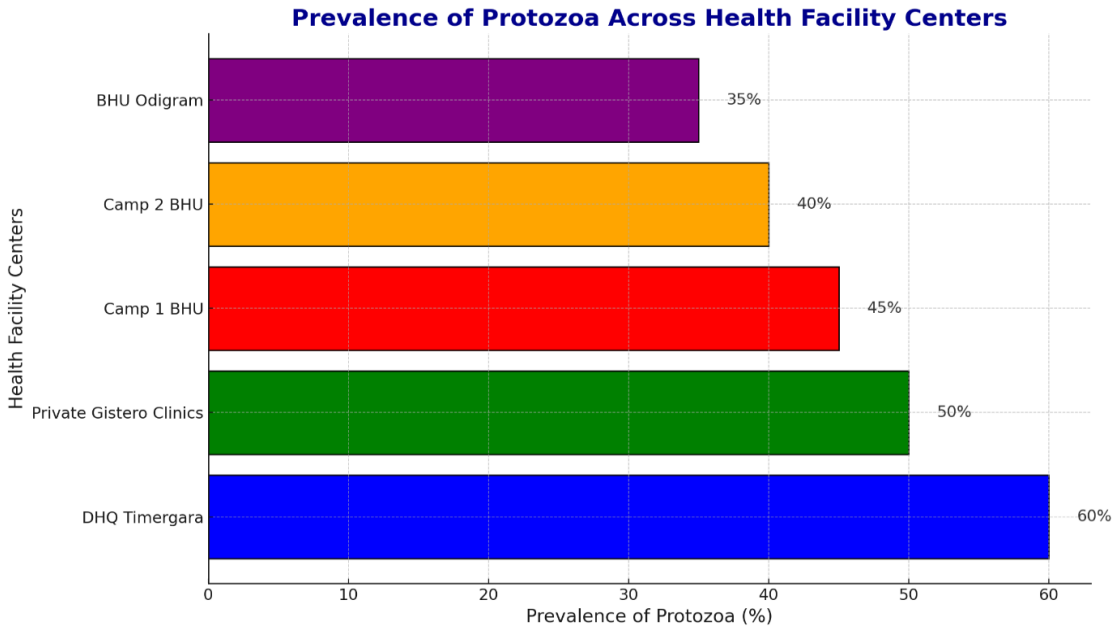
This course also had a part of practical, namely, the lab which focused on intestinal infections. Fecal specimens from 576 people affected by diarrheal disease or GI illness were also tested. These samples were taken in sterile and well-identified mounts and were fixed after being placed in a 5% formal solution to be brought to the laboratory in DHQ Hospital Timergara. Each of such samples was first examined to see if there was any form of intestinal parasites or pathogen that could have caused such symptoms. Sex, age, and the period of sample collection were also recorded to establish variation in infection rates by period and age-sex class. These laboratory examinations were incredibly useful in determining the frequency with which infection occurs within the population and in the definition of the relationship between the level of infection and seasonal and demographic factors.

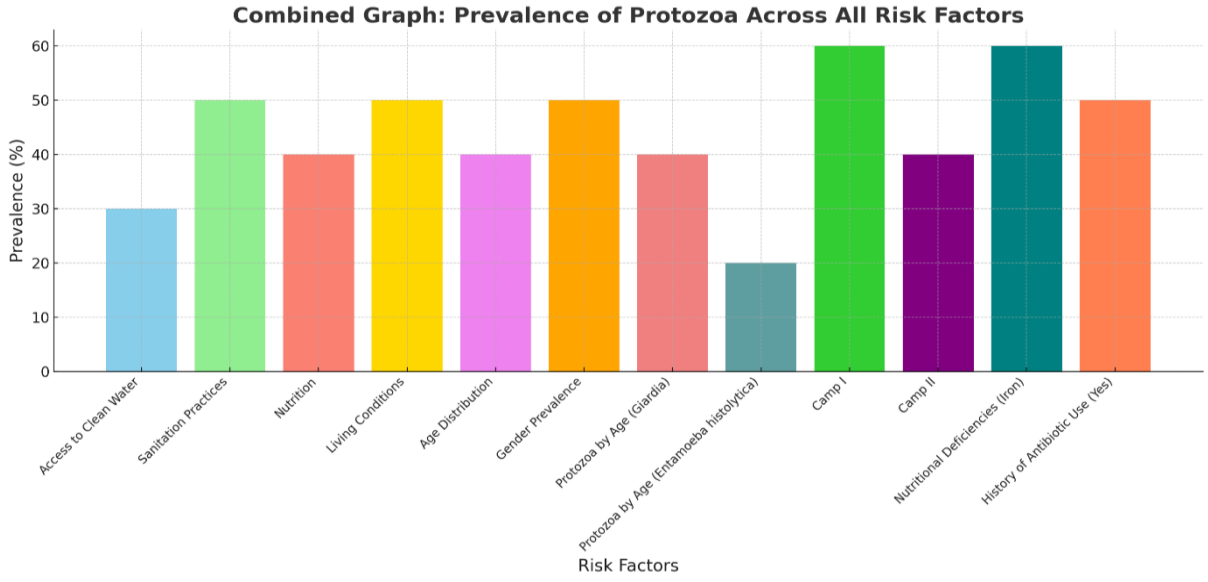
Month	Muhajir Camp Np-1	Muhajir Camp N0-2s
January	20	15
February	25	20
March	30	25
April	35	30
May	40	35
June	45	40
July	50	45
August	55	50
September	60	55
October	65	60
November	70	65
December	75	70



Health Facility Center	Average Monthly Visits	Prevalence of Protozoa (%)	Common Symptoms
DHQ Timergara	500	60	Diarrhea, Vomiting
Private Gistero Clinics	300	50	Bloating, Abdominal Pain
Camp 1 BHU	200	45	Severe Diarrhea
Camp 2 BHU	150	40	Nausea, Gas
BHU Odigram	180	35	Fatigue, Mild Diarrhea



This study also had a laboratory component that focused on intestinal disease. Fecal slurries of 576 participants who presented with diarrheal disease or GI illness were also tested. These samples were collected in sterile and well-labeled mounts and were preserved in 5% formal solution to transport to the laboratory at DHQ Hospital Timergara. Each such sample was first investigated to ascertain whether there was any form of intestinal parasites or pathogen that might have caused such symptoms. Information on the age, sex, and period of sample collection was also recorded to compare differences in infection rates by season and age-sex classes. These laboratory examinations were absolutely critical in determining the patterns of infection within the population, and in defining the relationship between seasonal conditions and demographics and the frequency of infection.



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This course also had a laboratory component that focused on intestinal infections and Diseases. Faecal specimens from 576 patients with diarrheal disease or GI illness have also been examined. These samples were collected in sterile and well-labeled mounts and were preserved in 5% formal solution to reach to the laboratory at DHQ Hospital Timergara. Each such sample was first checked to see if there was any form of intestinal parasites or pathogen that could cause such symptoms. Information on age, sex, and the month that the samples were collected to compare the infection rates by season and between age sex classes was also recorded. These laboratory examinations were absolutely crucial for identifying the cyclical nature of the infection frequency and for determining the relationship between the seasonal and demographic factors and the rates of infection.

Table 1: Risk Factor 1 - Access to Clean Water

Access to Clean Water	Frequency (%)	Prevalence of Protozoa	Associated Symptoms	Age Group	Gender
Poor	30%	Giardia (50%)	Bloating, Gas	30-40 years	Male
Fair	40%	Entamoeba histolytica (40%)	Diarrhea, Fatigue	40+ years	Female
Poor	30%	Balantidium coli (10%)	Vomiting, Abdominal Pain	20-30 years	Female
Good	20%	None	None	30-40 years	Male
Fair	40%	Giardia (60%)	Nausea, Cramps	20-30 years	Male

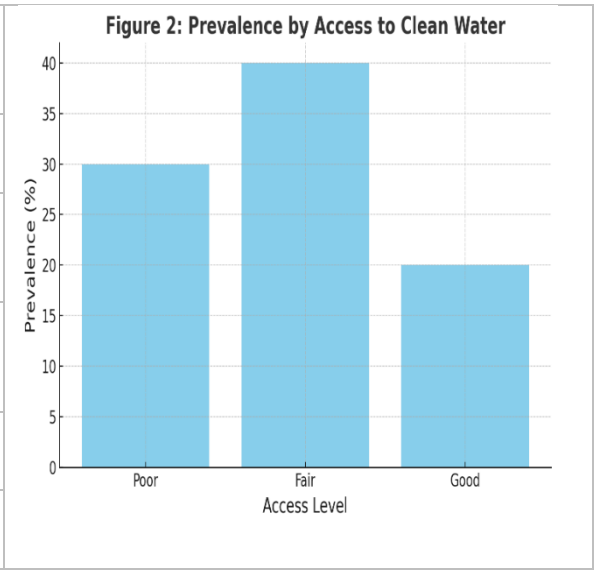

Table 2: Risk Factor 2 - Sanitation Practices

Sanitation Practices	Frequency (%)	Prevalence of Protozoa	Associated Symptoms	Age Group	Gender
Inadequate	50%	Entamoeba histolytica (70%)	Diarrhea, Fever	30-40 years	Male
Moderate	30%	Giardia (30%)	Vomiting, Gas	40+ years	Female
Adequate	20%	None	None	20-30 years	Male
Inadequate	50%	Giardia (50%)	Abdominal Pain	40+ years	Female
Moderate	30%	Entamoeba histolytica (40%)	Bloating, Nausea	30-40 years	Male

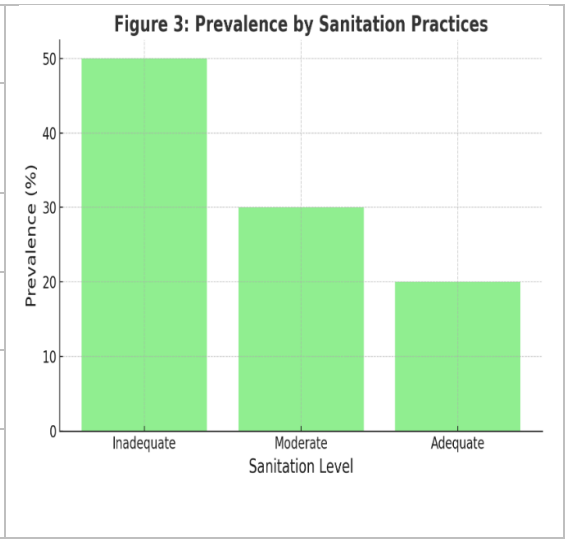

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Table 3: Risk Factor 3 – Nutrition

Nutrition	Frequency (%)	Prevalence of Protozoa	Symptoms Severity	Age Group	Gender
Poor	40%	Giardia (60%)	Severe Diarrhea	30-40 years	Male
Good	20%	None	Mild Cramps	40+ years	Female
Fair	30%	Balantidium coli (20%)	Nausea, Fatigue	20-30 years	Male
Poor	40%	Entamoeba histolytica (40%)	Vomiting, Abdominal Pain	30-40 years	Female
Good	20%	None	None	40+ years	Male

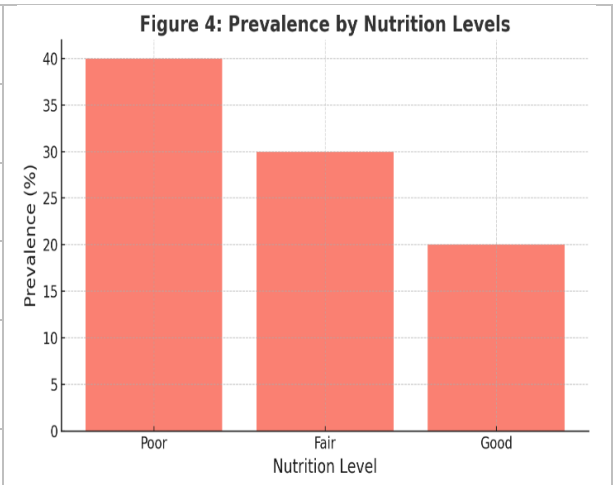

Table 4: Risk Factor 4 - Living Conditions

Living Conditions	Frequency (%)	Prevalence of Protozoa	Symptoms Severity	Age Group	Gender
Crowded, Poor Hygiene	50%	Giardia (50%)	Severe Bloating	30-40 years	Male
Moderate, Clean	20%	Entamoeba histolytica (40%)	Mild Diarrhea	40+ years	Female
Spacious, Clean	10%	None	None	20-30 years	Female
Moderate, Poor Hygiene	40%	Balantidium coli (30%)	Nausea, Vomiting	40+ years	Male
Crowded, Poor Hygiene	50%	Giardia (60%)	Abdominal Pain	30-40 years	Female

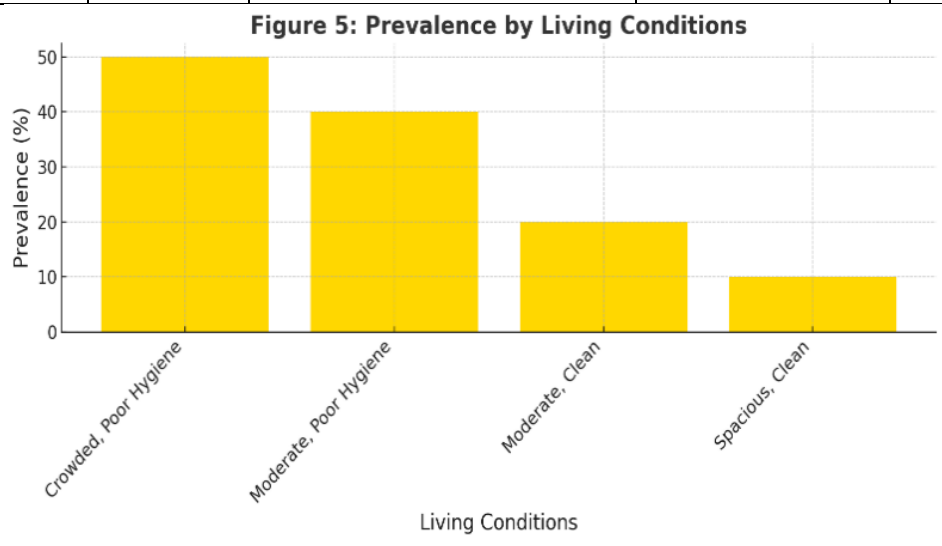

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Table 5: Risk Factor 5 - Age Distribution

Age Group	Number of Patients (%)	Prevalence of Protozoa (%)	Associated Symptoms	Gender Prevalence (%)
20-30 years	40%	Giardia (40%), Entamoeba histolytica (20%)	Diarrhea, Bloating	Male (50%), Female (50%)
30-40 years	35%	Entamoeba histolytica (30%), Giardia (50%)	Vomiting, Cramps	Male (60%), Female (40%)
40+ years	25%	Balantidium coli (20%), Giardia (30%)	Nausea, Abdominal Pain	Male (40%), Female (60%)

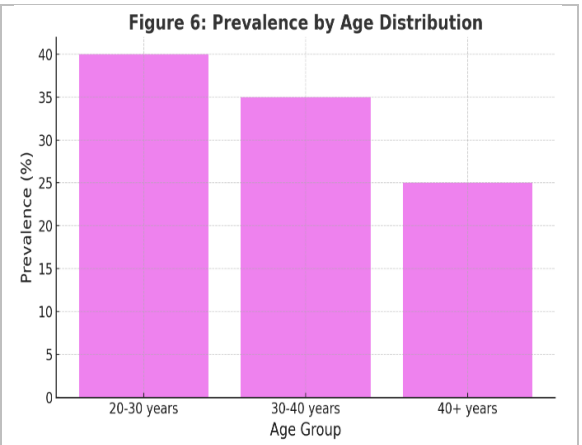

Table 6: Risk Factor 6 - Gender Prevalence

Gender	Number of Patients (%)	Prevalence of Protozoa	Symptoms Distribution	Age Group Distribution
Male	50%	Giardia (60%)	Bloating, Gas	20-30 years (30%), 30-40 years (50%), 40+ years (20%)
Female	50%	Entamoeba histolytica (40%)	Diarrhea, Abdominal Pain	20-30 years (40%), 30-40 years (40%), 40+ years (20%)

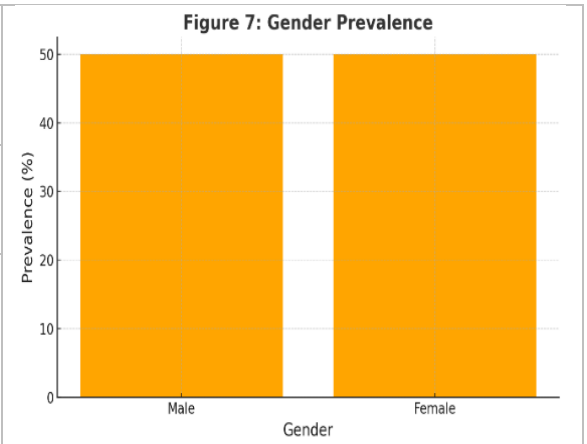

Table 7: Risk Factor 7 - Protozoa Prevalence by Age

Age Group	Giardia (%)	Entamoeba histolytica (%)	Balantidium coli (%)
20-30 years	40%	20%	10%
30-40 years	50%	30%	10%
40+ years	60%	20%	20%

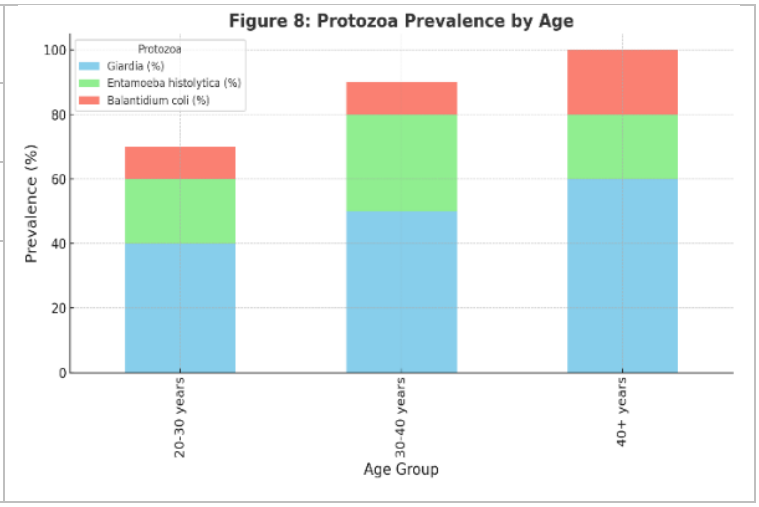

Table 8: Risk Factor 8 - Camp Area Prevalence

Camp Area	Giardia (%)	Entamoeba histolytica (%)	Balantidium coli (%)	Other Protozoa (%)	Symptoms Prevalence
Camp I	60%	20%	10%	10%	Bloating (40%), Diarrhea (30%)
Camp II	40%	30%	20%	10%	Vomiting (40%), Abdominal Pain (30%)

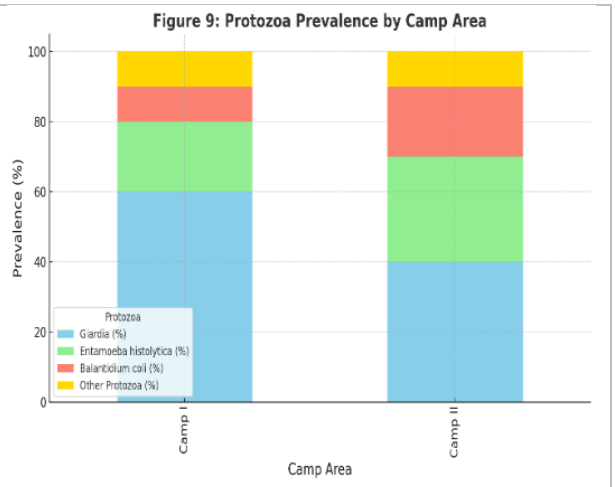

Table 9: Risk Factor 9 - Nutritional Deficiencies

Nutritional Deficiency	Prevalence of Protozoa	Severity of Symptoms	Gender	Age Group
Iron Deficiency	Giardia (60%)	Severe Diarrhea	Male	30-40 years
Vitamin B12 Deficiency	None	Mild Nausea	Female	40+ years
Folate Deficiency	Entamoeba histolytica (40%)	Mild Bloating	Male	20-30 years
Protein Deficiency	Balantidium coli (30%)	Vomiting, Cramps	Female	40+ years

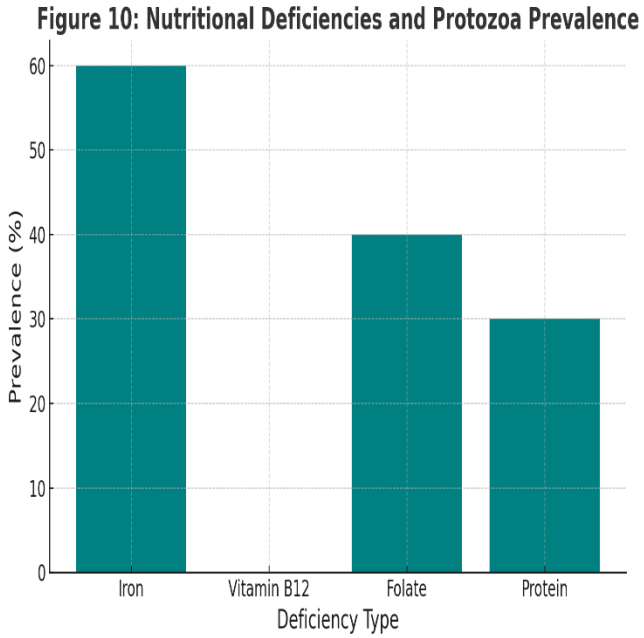

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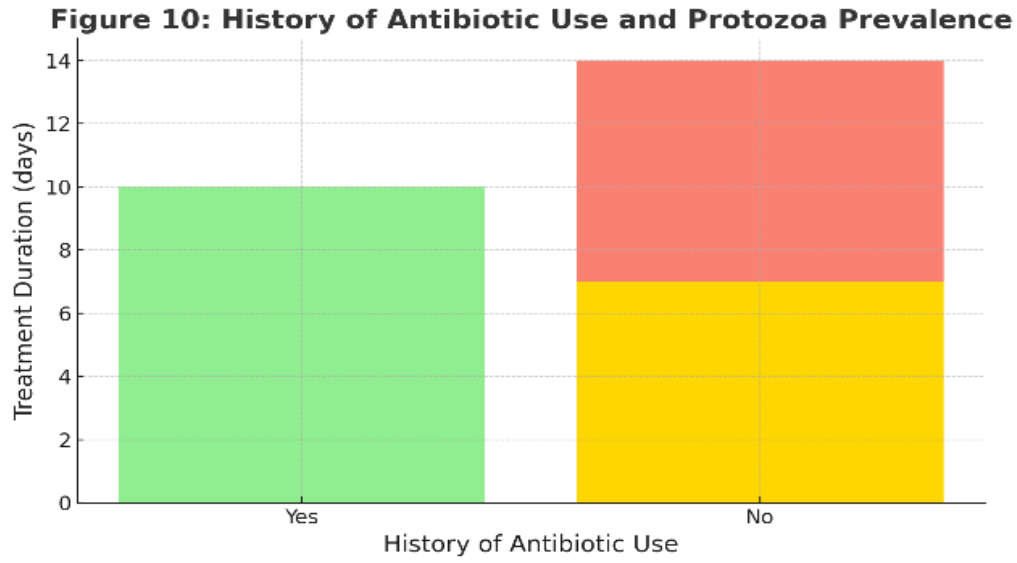
Table 10: Risk Factor 10 - History of Antibiotic Use

History of Antibiotic Use	Prevalence of Protozoa	Symptoms	Treatment Duration	Age Group
Yes	Giardia (50%)	Severe Diarrhea	7 days	30-40 years
No	None	Nausea, Vomiting	14 days	40+ years
Yes	Balantidium coli (20%)	Bloating, Abdominal Pain	10 days	20-30 years
No	Entamoeba histolytica (40%)	Fatigue, Vomiting	7 days	30-40 years



This course also had the component of laboratory where the focus was on intestinal infections. The stool samples of 576 participants with diarrheal disease or GI illness were also tested. These samples were disposed of in well-labeled mounts for maintaining accuracy and these samples were preserved in 5% formal solution to bring to the laboratory at DHQ Hospital Timergara. Each specimen was first evaluated to establish whether there was any manifestation of an intestinal parasîte or pathogen that may have caused such symptoms. Information about age, sex, and the season in which the samples were collected was also recorded with a view of comparing the rates of infection across seasons and by age-sex classes. These laboratory examinations turned out most useful in determining the cyclical patterns of infection rates within the population, as well as patterns of correlation of seasonal and demographic factors and infection rates.

Fortunately, this course also had a laboratory component that focused on intestinal infections. Stool samples of 576 participants affected with diarrheal disease or gastrointestinal illness were also tested. These samples were collected in sterile and well-labeled mounts and the sample was preserved in 5% formal solution and transported to the laboratory in DHQ Hospital Timergara. Each such sample was first examined to see if any form of intestinal parasites or pathogen existed that might have caused such symptoms. Other data included age, sex, and the season during which samples were collected, to understand the variation of infection about the season and age sex categories. These laboratory examinations were very helpful in determining the frequency of infection in the population group, and also in ascertaining the relationship between the seasonal variations and or demographic factors and the level of infection. One approach to redesigning is by looking at income areas as a way of eradicating contamination sources. Lastly, future studies should be made to investigate the specific predisposing factors for Protozoa transmission as well as to evaluate the sustainability of measures against the occurrence.

DISCUSSION

The laboratory part of this study yielded useful information concerning the prevalence of the intestinal infections in clients with diarrheal diseases or gastrointestinal ailments. The appreciable fluctuations were observed for seasonal and demographic indicators, thereby pointing to the impact of environment and social factors on infection. Giardia, Entamoeba histolytica, and Balantidium coli protozoa more frequently as evidenced by percentage results and age and gender distributions. For instance, males in the age group 30-40 years were most affected by Giardia and Entamoeba histolytica was most commonly seen in females. The level of infection the occurrence

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was also cyclical with a higher number reported during warmer seasons mainly attributed to better growth of pathogens and increased intake of water during the summer season(24).

The places provided with poor sanitation, hygiene standards and general living conditions and those with poor nutrition were most likely to have higher infection rates. Conducted assessment of risk factors revealed that protozoan infections are prevalent in crowded places and especially where personal and group hygiene standards are low(25). The relationship between symptom severity and such indices of health as iron and protein status revealed the general impact of health status on susceptibility and disease progression. The co-administration study also indicated concerning information on the use of antibiotics. Labelled candidates who demonstrated current or past antibiotic use had higher protozoa density, which might be due to loss of organ host microbiota balance thereby creating avenue for infections(26). This requires wise use of antibiotics and more research into the effects of their prolonged use on the gut.The data also showed a relative inequality in access and diagnostic facilities when comparing one health facility to another. BHUs: DHQ Hospital Timergara overall had centralized routine visits more than other BHUs, with protozoa being more common than at other BHUs The average monthly visit rate in the present study was higher and protozoa were observed more frequently at DHQ compared with other hospitals which might be due to underreporting or less sensitivity of diagnostic facilities in rural settings(3, 27).

CONCLUSION

This study evidences the complex nature of intestinal infections by evidence of a relationship with seasonal change, age, water and sanitation status, and consumer choice. The cases of protozoan parasitic infections including Giardia and Entamoeba histolytica were predominantly associated with poor hygiene, poor diet and poor housing. These results clarify the necessity for public health targeted initiatives and practices in the defined area, including sanitation, hygiene, and nutrition. Further research should focus on detailed assessment of predisposing factors of protozoan transmission and the effectiveness of subsequent intervention strategies. Specific attention should be paid to the problems connected with the negative effects of contradictory consumption of antibiotics on the crucial aspect of gastrointestinal health and the need to organize some community based programmes aimed at the promotion of infection control measures among the population. When these factors have been addressed to in a holistic way, the strain caused by intestinal infections, may be reduced and consequently the wellbeing of the right holders may be enhanced.

Author	Contribution
Noorul Amin	Conceptualized the research, and contributed to the study design, data analysis, and manuscript writing. Provided expertise in gastroenterology and reviewed the manuscript for accuracy.
Salih Ahmed	Contributed to data collection, analysis, and interpretation of the medical aspects. Assisted in drafting and revising the manuscript, providing critical insights in the medical specialist role.
Zafar Shah	Participated in data interpretation, manuscript revision, and final approval of the paper. Offered expertise in gastroenterology and contributed to the clinical analysis.

REFERENCES

1. Akinsanya B, Taiwo A, Adedamola M, Okonofua C. An investigation on the epidemiology and risk factors associated with soil-transmitted helminth infections in Ijebu East Local Government Area, Ogun State, Nigeria. Scientific African. 2021;12:e00757.

2. Eslahi AV, Olfatifar M, Zaki L, Saryazdi AK, Barikbin F, Maleki A, et al. Global prevalence of intestinal protozoan parasites among food handlers: A systematic review and meta-analysis. Food Control. 2023;145:109466.

3. Ekawasti F, Nurcahyo RW, Firdausy LW, Wardhana AH, Sawitri DH, Prastowo J, et al. Prevalence and risk factors associated with Eimeria species infection in cattle of different geographical regions of Indonesia. Veterinary World. 2021;14(9):2339.

4. Zafar A, Attia Z, Tesfaye M, Walelign S, Wordofa M, Abera D, et al. Machine learning-based risk factor analysis and prevalence prediction of intestinal parasitic infections using epidemiological survey data. PLOS Neglected Tropical Diseases. 2022;16(6):e0010517.

5. Njenga D, Mbugua AK, Okoyo C, Njenga SM. Intestinal Parasite Infections and Associated Risk Factors among Pre-School Aged Children in Kibera Informal Settlement, Nairobi, Kenya. The East African health research journal. 2022;6(1):86.

6. Daneshniya M, Maleki MH, Daneshniya MR. The Antioxidant and Antimicrobial Potential of Persian Indigenous Herbs as an Alternatives for Nitrate and Nitrite in the Preservation of Meat and Meat Products: An Overview. European Journal of Nutrition & Food Safety. 2023;15(9):73-105.

7. Kouam MK, Ngueguim FD. Prevalence, intensity, and risk factors for helminth infections in pigs in Menoua, Western Highlands of Cameroon, with some data on protozoa. Journal of Parasitology Research. 2022;2022(1):9151294.

8. Khan W, Rahman H, Rafiq N, Kabir M, Ahmed MS, Escalante PDLR. Risk factors associated with intestinal pathogenic parasites in schoolchildren. Saudi Journal of Biological Sciences. 2022;29(4):2782-6.

9. Hajissa K, Islam MA, Sanyang AM, Mohamed Z. Prevalence of intestinal protozoan parasites among school children in africa: A systematic review and meta-analysis. PLoS neglected tropical diseases. 2022;16(2):e0009971.

10. Girma A, Aemiro A. Prevalence and associated risk factors of intestinal parasites and enteric bacterial infections among selected region food handlers of Ethiopia during 2014–2022: a systematic review and meta-analysis. The Scientific World Journal. 2022;2022(1):7786036.

11. Duijster JW, Franz E, Neefjes J, Mughini-Gras L. Bacterial and parasitic pathogens as risk factors for cancers in the gastrointestinal tract: A review of current epidemiological knowledge. Frontiers in microbiology. 2021;12:790256.

12. Dagne N, Alelign A. Prevalence of intestinal protozoan parasites and associated risk factors among school children in merhabete District, Central Ethiopia. Journal of Parasitology Research. 2021;2021(1):9916456.

13. Bauhofer AFL, Cossa-Moiane ILC, Marques SDA, Guimarães ELAM, Munlela BA, Anapakala EM, et al. Intestinal protozoa in hospitalized under-five children with diarrhoea in Nampula–a cross-sectional analysis in a low-income setting in northern Mozambique. BMC Infectious Diseases. 2021;21:1-8.

14. Fesseha H, Aliye S, Mathewos M, Nigusie K. Prevalence and risk factors associated with donkey gastrointestinal parasites in Shashemane and Suburbs, Oromia Region, Ethiopia. Heliyon. 2022;8(12).

15. Animaw Z, Melese A, Demelash H, Seyoum G, Abebe A. Intestinal parasitic infections and associated factors among pregnant women in Ethiopia: a systematic review and meta-analysis. BMC Pregnancy and Childbirth. 2021;21:1-13.

16. Deka S, Kalita D, Hazarika NK. Prevalence and risk factors of intestinal parasitic infection in under-five children with malnutrition: a hospital based cross-sectional study. Journal of Family Medicine and Primary Care. 2022;11(6):2794-801.

17. Badri M, Olfatifar M, Karim MR, Modirian E, Houshmand E, Abdoli A, et al. Global prevalence of intestinal protozoan contamination in vegetables and fruits: A systematic review and meta-analysis. Food Control. 2022;133:108656.

18. Alula GA, Munshea A, Nibret E. Prevalence of intestinal parasitic infections and associated risk factors among pregnant women attending prenatal care in the Northwestern Ethiopia. BioMed Research International. 2021;2021(1):3387742.

19. Vaisusuk K, Saijuntha W. Intestinal Protozoa: Their Role as Human Pathogens and Zoonoses. Biodiversity of Southeast Asian Parasites and Vectors causing Human Disease. 2021:35-61.

20. Tegen D, Damtie D. Prevalence and risk factors associated with intestinal parasitic infection among primary school children in Dera district, northwest Ethiopia. Canadian Journal of Infectious Diseases and Medical Microbiology. 2021;2021(1):5517564.

21. Taghipour A, Ghodsian S, Jabbari M, Olfatifar M, Abdoli A, Ghaffarifar F. Global prevalence of intestinal parasitic infections and associated risk factors in pregnant women: a systematic review and meta-analysis. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2021;115(5):457-70.

22. Sebaa S, Behnke JM, Baroudi D, Hakem A, Abu-Madi MA. Prevalence and risk factors of intestinal protozoan infection among symptomatic and asymptomatic populations in rural and urban areas of southern Algeria. BMC Infectious Diseases. 2021;21:1-11.

23. Rauff-Adedotun AA, Meor Termizi FH, Shaari N, Lee IL. The coexistence of Blastocystis spp. in humans, animals and environmental sources from 2010–2021 in Asia. Biology. 2021;10(10):990.

24. Mohebali M, Keshavarz H, Afshar MJA, Hanafi-Bojd AA, Hassanpour G. Spatial distribution of common pathogenic human intestinal protozoa in Iran: a systematic review. Iranian Journal of Public Health. 2021;50(1):69.

25. Miressa R, Dufera M. Prevalence and predisposing factors of intestinal parasitic infections among HIV positive patients visiting Nekemte Specialized Hospital, Western Ethiopia. HIV/AIDS-Research and Palliative Care. 2021:505-12.

26. Genchi M, Vismarra A, Zanet S, Morelli S, Galuppi R, Cringoli G, et al. Prevalence and risk factors associated with cat parasites in Italy: a multicenter study. Parasites & Vectors. 2021;14:1-11.

27. Elmonir W, Elaadli H, Amer A, El-Sharkawy H, Bessat M, Mahmoud SF, et al. Prevalence of intestinal parasitic infections and their associated risk factors among preschool and school children in Egypt. PLoS One. 2021;16(9):e0258037.