

Research Article



Intestinal Parasites in Diarrheal Patients in Bandar Abbas, Southern Iran

Majid Najafi-Asl¹ , Saeed Hosseini Teshnizi², Maryam Sarani³, Majid Teremahi Ardestani⁴, Khojasteh Sharifi-Sarasiabi^{3*} ¹Department of Parasitology, Faculty of Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran²Department of Biostatistics, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran³Infectious and Tropical Diseases Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran⁴Department of Laboratory Science, Faculty of Para-Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Abstract

Background: Diarrheal diseases are the major causes of morbidity and mortality in developing countries and the second most common cause of death in children under five years. The main objective of the study was to determine the prevalence of intestinal parasites in diarrheal patients in Bandar Abbas, Southern Iran.**Methods:** This cross-sectional study was conducted to assess the prevalence of intestinal parasitic infections and associated factors among patients with diarrhea in the major hospitals of Bandar Abbas. A single fecal specimen was collected from 170 diarrheic patients from October 2018 to May 2019. The diagnosis was made based on the direct wet mount and formalin-ether concentration method. Trichrome and modified acid-fast staining methods were used for the better detection of protozoa. The collected data were analyzed using SPSS software.**Results:** A total of 170 stool specimens were collected from diarrheic patients. Of these, 57.6% were males and 42.4% were females. The overall prevalence of intestinal parasites was 12.9%. The most prevalent parasite was *Blastocystis* spp. 10 (5.9%), followed by *Giardia lamblia* 7 (4.1%), *Cryptosporidium* spp. 3 (1.8%), *Entamoeba coli* 1 (0.6%), and *Hymenolepis nana* 1 (0.6%).**Conclusion:** Overall, the results showed that intestinal parasites, especially helminth infections, have significantly decreased in recent years.**Keywords:** Diarrhea, Gastroenteritis, Iran, Parasitic diseases, Prevalence

*Correspondence to

Khojasteh Sharifi-Sarasiabi,
Email: sharifisarasabi@gmail.com

Received March 16, 2021, Accepted: May 30, 2021, Published Online: December 12, 2022

Background

Diarrhea is one of the most common causes of gastrointestinal disease causing morbidity and mortality in the developing world (1, 2). Intestinal parasites, pathogenic bacteria, and viruses are the main causes of diarrhea. Intestinal parasites are considered important human parasites and an essential public health issue in most communities, especially in tropical and subtropical regions (3). It is estimated that 1.7 billion cases of diarrhea annually occur, in general, and 1.5 million in young children in particular (4, 5). Diarrheal disease is the second most common cause of death in children under five years (1). A significant proportion of diarrheal diseases can be prevented by providing healthy water and personal hygiene (6). Intestinal protozoa, which are more common in children with diarrhea, include *Giardia lamblia* (*G. lamblia*), *Blastocystis* species, *Entamoeba histolytica*, *Cryptosporidium* species, and *Dientamoeba fragilis* (7). *G. lamblia* is one of the causes of diarrhea with a prevalence of 2%-5% and 20%-30% in developed and developing countries, respectively (8). *Blastocystis* spp. are the most common enteric protozoa isolated from diarrheal patients in most developed countries

(9). Although it has been a long time since its discovery, there are many controversies about the pathogenicity of this parasite. Nonspecific symptoms such as diarrhea, abdominal pain, nausea, fatigue, vomiting, anorexia, and flatulence are detected in those who demonstrate clinical signs (10).

Objectives

The current study mainly aimed to determine the prevalence of intestinal parasites in diarrheal patients in Bandar Abbas, Southern Iran.

Methods

Study Area and Study Population

This cross-sectional study was performed to evaluate the prevalence of intestinal parasitic infections and related factors among patients with diarrhea referring to 3 hospitals in Bandar Abbas, Iran from October 2018 to May 2019. The census method was used for the sampling. This city is located in southern Iran; a tropical region, attached to the Persian Gulf with high humidity (20%-100%) and a warm climate (11).

Data Collection and Parasitological Examination

The stool samples (watery and loose) of patients with the symptoms of gastroenteritis, who were admitted to infectious wards or referred to the laboratory, were evaluated based on the aim of the study. After obtaining written consent, the researcher administered a questionnaire to each patient, including items on sociodemographic characteristics such as age, gender, occupation and educational level (the parents caring for the patient), residency (urban or rural), type of reception (outpatient or inpatient), contact with animals, underlying diseases, addiction, and recent travel history within 3 months. The recipients of anti-parasitic drugs and diarrheic patients from bacterial infections were excluded from the study.

A single fresh stool sample was collected from each participant with a clean stool cup and immediately transferred to the laboratory of the Paramedical Faculty of Hormozgan University of Medical Sciences. The specimens were examined by the direct wet mount (normal saline and Lugol) and formalin-ether concentration method (3) which enhanced the recovery of protozoan cysts and ova of helminths. Trichrome staining was used for the better detection of protozoa. The oocysts of *Cryptosporidium* spp. were identified by a permanent slide after the formalin-ether concentration method and stained with the modified acid-fast staining.

Statistical Analysis

SPSS software (version 20, Chicago, IL, USA) was applied for the data analysis. In addition, the relationship between the variables and the presence of intestinal parasites was assessed by the chi-square test, and the level of significance was $P < 0.05$.

Results

A total of 170 diarrhea patients' stools were evaluated in this research. Of these, 57.6% and 42.4% of specimens were collected from males and females, respectively. Table 1 presents the detailed sociodemographic characteristics of the diarrheic individuals in three hospitals in Bandar Abbas. The overall prevalence of intestinal parasites was 22 (12.9%). Based on data in Table 2, the most common protozoan species were *Blastocystis* spp. 10 (5.9%) and *G. lamblia* 7 (4.1%). No statistically significant relationship was found between the infection and the variables ($P > 0.05$).

Discussion

In this cross-sectional study, the overall prevalence of intestinal parasites was found to be 12.9% among diarrheal patients in Bandar Abbas' hospitals; this rate was lower in our study compared to the studies conducted in the other parts of Iran and other countries, including Nahavand, western Iran (32.2%) (12) and Northwest Ethiopia (56.9%) (13). However, it is consistent with that of a study

Table 1. Sociodemographic Characteristics and Intestinal Parasites of the Diarrheic Individuals of Three Hospitals in Bandar Abbas, Iran

| Variable | Number (%) |
|----------------------|------------|
| Age group (y) | |
| < 5 | 59 (34.7) |
| 5-15 | 17 (10) |
| 15-30 | 23 (13.5) |
| > 30 | 71 (41.8) |
| Gender | |
| Male | 98 (57.6) |
| Female | 72 (42.4) |
| Occupation | |
| Animal husbandman | 2 (1.2) |
| Farmer | 7 (4.1) |
| Labor | 9 (5.3) |
| Housewife | 67 (39.4) |
| Employee | 31 (18.2) |
| Others | 54 (31.8) |
| Educational level | |
| < Diploma | 112 (65.9) |
| Diploma | 28 (16.5) |
| > Diploma | 30 (17.6) |
| Residency | |
| Urban | 119 (70) |
| Rural | 51 (30) |
| Type of reception | |
| Outpatients | 73 (42.9) |
| Inpatients | 97 (57.1) |
| Contact with animals | |
| Yes | 41 (24.1) |
| No | 129 (75.9) |
| Underlying disease | |
| Yes | 38 (22.4) |
| No | 132 (77.6) |
| Travel history | |
| Yes | 98 (57.6) |
| No | 72 (42.4) |
| Addiction | |
| Yes | 11 (6.5) |
| No | 159 (93.5) |

Table 2. Prevalence of Intestinal Parasites in Diarrheal Patients in Bandar Abbas, Southern Iran

| Parasites | Number (%) |
|-----------------------------|------------|
| <i>Giardia lamblia</i> | 7 (4.1) |
| <i>Entamoeba coli</i> | 1 (0.6) |
| <i>Blastocystis</i> spp. | 10 (5.9) |
| <i>Hymenolepis nana</i> | 1 (0.6) |
| <i>Cryptosporidium</i> spp. | 3 (1.8) |
| Total | 22 (12.9) |

performed in Northern Iran 9.1% by Vahedi et al (14). Our data, compared to those obtained by Zebardast et al (3) in different parts of Iran, suggested that not only it is in line with the overall prevalence of intestinal parasites (10.6%) but also with the prevalence of various parasites. Similar to many other studies, *G. lamblia* and *Blastocystis* spp. were the most common parasites in diarrheal patients (12, 15). Differences in the health standards of each region, as well as the methods used to detect parasites, are the reasons for the difference in the prevalence of parasites.

The role of *Blastocystis* spp. in the pathogenesis and pathology of the gastrointestinal tract is unclear and has always been debatable (10). The parasite appears to have many subtypes, and it is unclear which is more involved in human disease; however, the third subtype is more common in human studies (9). Unfortunately, the determination of *Blastocystis* subtypes was not within the scope of the study, which is one of the limitations of the present study. The prevalence of *Blastocystis* spp. was 5.9%, which conforms to the result of the study of Khoshnood et al (3.33%) in southwestern of Iran (16), but inconsistent with the finding of Vahedi et al (1.8%) in Northern Iran (14).

The prevalence of *Cryptosporidium* spp. using acid-fast staining was 1.8%, which matches the results of many other studies in the country (12, 17), while not being in line with the findings of studies in other countries and Iran (18).

Compared to the findings of a previous study conducted in Bandar Abbas (19), the prevalence of the parasite has significantly decreased due to the differences between the subjects.

The prevalence of *G. lamblia* was 4.1%, which corroborates with the results of other studies (4.1%, 2.3%, and 2.75%) conducted in Mazandaran and Nahavand) in Iran (12, 14) and Pakistan (20). Despite the high percentage of children under 15 years (44.7%) in this study, we expected a higher prevalence of *G. lamblia*, as the prevalence of this parasite in children under 5 years was 16.7% in Ethiopia (21). It should be noted that the prevalence of the parasite in primary school children was 17.23% (22) in Bandar Abbas in the past 20 years. Increasing the level of health and literacy in the community and improving the environment are effective factors in reducing this parasite. However, as mentioned earlier, bacterial or viral agents may have been involved in the diarrhea of these patients, which should be investigated in the future.

The prevalence of parasitic helminths in the present study was extremely low, only one case of *Hymenolepis nana* was detected, which conforms to the result of Vahedi et al in northern Iran and Kiani et al in western Iran (12, 14). Intestinal helminthiasis have been decreasing in recent years throughout the country (23). Only parasites with direct fecal-oral transmission were observed with a low prevalence. Sanitation and hygiene have played a role

in this declining trend by increasing public awareness and improving health.

The other limitation of the research was the small number of samples due to the limited time because this article is the result of an MSc student's thesis.

Conclusion

Blastocystis spp. and *G. lamblia* were the predominant intestinal parasites detected in patients with diarrhea. The results revealed that intestinal parasites, especially helminth infections, have significantly decreased in recent years.

Acknowledgments

We would like to thank Hormozgan University of Medical Sciences for supporting and funding this study. We greatly appreciate the participants for cooperation during the study.

Author Contributions

Study concept and design: KSS and MN; Analysis and interpretation of data: KSS, MN, and SHT; Drafting of the manuscript: KSS and MTA; Statistical analysis: SHT; Acquisition of data: MN, SHT, MS, and KSS; Critical revision of the manuscript for the important intellectual content: MN, SHT, MS, MTA, and KSS.

Conflict of Interests

The authors declare that there is no conflict of interests.

Ethical Approval

The Ethics Committee of Hormozgan University of Medical Sciences approved the study protocol (IR.HUMS.REC.1397.164).

Funding

This study was financially supported by Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

Informed Consent

The aim of the study was described to patients or their parents and informed consent was obtained from all the enrolled ones.

References

1. Lima AAM, Oliveira DB, Quetz JS, Havt A, Prata MMG, Lima IFN, et al. Etiology and severity of diarrheal diseases in infants at the semiarid region of Brazil: a case-control study. *PLoS Negl Trop Dis*. 2019;13(2):e0007154. doi: [10.1371/journal.pntd.0007154](https://doi.org/10.1371/journal.pntd.0007154).
2. Huruy K, Kassu A, Mulu A, Worku N, Fetene T, Gebretsadik S, et al. Intestinal parasitosis and shigellosis among diarrheal patients in Gondar teaching hospital, northwest Ethiopia. *BMC Res Notes*. 2011;4:472. doi: [10.1186/1756-0500-4-472](https://doi.org/10.1186/1756-0500-4-472).
3. Zebardast N, Gharavi MJ, Abadi A, Seyyed Tabaei SJ, Yeganeh F, Khazan H, et al. Frequency of intestinal parasites in patients with gastrointestinal disorders, in different parts of Iran during 2012-2013. *Int J Enteric Pathog*. 2015;3(1):e22682. doi: [10.17795/ijep22682](https://doi.org/10.17795/ijep22682).
4. Ibrahim A, Ali YBM, Abdel-Aziz A, El-Badry AA. Helicobacter pylori and enteric parasites co-infection among diarrheic and non-diarrheic Egyptian children: seasonality, estimated risks, and predictive factors. *J Parasit Dis*. 2019;43(2):198-208. doi: [10.1007/s12639-018-1075-y](https://doi.org/10.1007/s12639-018-1075-y).
5. Ferdous F, Das SK, Ahmed S, Farzana FD, Latham JR, Chisti MJ, et al. Severity of diarrhea and malnutrition among under five-year-old children in rural Bangladesh. *Am J Trop Med*

- Hyg. 2013;89(2):223-8. doi: [10.4269/ajtmh.12-0743](https://doi.org/10.4269/ajtmh.12-0743).
6. Moradi G, Piroozi B, Safari H, Alinia C, Gouya MM, Aghili N, et al. Incidence, mortality, and burden of acute watery diarrhea and its geographical distribution in Iran during 2009-2016. *Iran J Public Health*. 2019;48(Suppl 1):36-43.
 7. Boughattas S, Behnke JM, Al-Ansari K, Sharma A, Abu-Alainin W, Al-Thani A, et al. Molecular analysis of the enteric protozoa associated with acute diarrhea in hospitalized children. *Front Cell Infect Microbiol*. 2017;7:343. doi: [10.3389/fcimb.2017.00343](https://doi.org/10.3389/fcimb.2017.00343).
 8. Júlio C, Vilares A, Oleastro M, Ferreira I, Gomes S, Monteiro L, et al. Prevalence and risk factors for *Giardia duodenalis* infection among children: a case study in Portugal. *Parasit Vectors*. 2012;5:22. doi: [10.1186/1756-3305-5-22](https://doi.org/10.1186/1756-3305-5-22).
 9. Fletcher SM, Stark D, Harkness J, Ellis J. Enteric protozoa in the developed world: a public health perspective. *Clin Microbiol Rev*. 2012;25(3):420-49. doi: [10.1128/cmr.05038-11](https://doi.org/10.1128/cmr.05038-11).
 10. Abdulsalam AM, Ithoi I, Al-Mekhlafi HM, Khan AH, Ahmed A, Surin J, et al. Prevalence, predictors and clinical significance of *Blastocystis* sp. in Sebha, Libya. *Parasit Vectors*. 2013;6:86. doi: [10.1186/1756-3305-6-86](https://doi.org/10.1186/1756-3305-6-86).
 11. Heydari-Hengami M, Hamed Y, Najafi-Asl M, Sharifi-Sarasiabi K. Prevalence of intestinal parasites in food handlers of Bandar Abbas, Southern Iran. *Iran J Public Health*. 2018;47(1):111-8.
 12. Kiani H, Haghighi A, Rostami A, Azargashb E, Seyyed Tabaei SJ, Solgi A, et al. Prevalence, risk factors and symptoms associated to intestinal parasite infections among patients with gastrointestinal disorders in Nahavand, Western Iran. *Rev Inst Med Trop Sao Paulo*. 2016;58:42. doi: [10.1590/s1678-9946201658042](https://doi.org/10.1590/s1678-9946201658042).
 13. Tigabu A, Taye S, Aynalem M, Adane K. Prevalence and associated factors of intestinal parasitic infections among patients attending Shahura Health Center, Northwest Ethiopia. *BMC Res Notes*. 2019;12(1):333. doi: [10.1186/s13104-019-4377-y](https://doi.org/10.1186/s13104-019-4377-y).
 14. Vahedi M, Gohardehi S, Sharif M, Daryani A. Prevalence of parasites in patients with gastroenteritis at East of Mazandaran Province, Northern Iran. *Trop Biomed*. 2012;29(4):568-74.
 15. Seyer A, Karasartova D, Ruh E, Güreşer AS, Turgal E, Imir T, et al. Epidemiology and prevalence of *Blastocystis* spp. in North Cyprus. *Am J Trop Med Hyg*. 2017;96(5):1164-70. doi: [10.4269/ajtmh.16-0706](https://doi.org/10.4269/ajtmh.16-0706).
 16. Khoshnood S, Rafiei A, Saki J, Alizadeh K. Prevalence and genotype characterization of *Blastocystis hominis* among the Baghmalek people in southwestern Iran in 2013-2014. *Jundishapur J Microbiol*. 2015;8(10):e23930. doi: [10.5812/jjm.23930](https://doi.org/10.5812/jjm.23930).
 17. Gholami S, Khanmohammadi M, Ahmadpour E, Pagheh AS, Khadem Nakhjiri S, Ramazannipour H, et al. *Cryptosporidium* infection in patients with gastroenteritis in Sari, Iran. *Iran J Parasitol*. 2014;9(2):226-32.
 18. Dabirzadeh M, Khoshsima Shahraki M, Rostami D, Bagheri S. Prevalence of *Cryptosporidium* species in children referred to central and hospital laboratories of Zabol city, south east of Iran. *Int J Pediatr*. 2017;5(12):6359-64. doi: [10.22038/ijp.2017.22358.1871](https://doi.org/10.22038/ijp.2017.22358.1871).
 19. Hamed Y, Safa O, Haidari M. *Cryptosporidium* infection in diarrheic children in southeastern Iran. *Pediatr Infect Dis J*. 2005;24(1):86-8. doi: [10.1097/01.inf.0000148932.68982.ec](https://doi.org/10.1097/01.inf.0000148932.68982.ec).
 20. Naz A, Nawaz Z, Rasool MH, Zahoor MA. Cross-sectional epidemiological investigations of *Giardia lamblia* in children in Pakistan. *Sao Paulo Med J*. 2018;136(5):449-53. doi: [10.1590/1516-3180.2018.0350060918](https://doi.org/10.1590/1516-3180.2018.0350060918).
 21. Alegria I, Ramos JM, Tisiano G, Yohannes T, Gosa A, Reyes F. Intestinal parasites among children with diarrhea younger than 5 years of age in rural Ethiopia. *Pediatr Infect Dis J*. 2015;34(2):226-7. doi: [10.1097/inf.0000000000000531](https://doi.org/10.1097/inf.0000000000000531).
 22. Sharifi-Sarasiabi K, Madani A, Zare S. Prevalence of intestinal parasites in primary school pupils of Bandar Abbas. *Hormozgan Med J*. 2001;5(4):25-30. [Persian].
 23. Rokni MB. The present status of human helminthic diseases in Iran. *Ann Trop Med Parasitol*. 2008;102(4):283-95. doi: [10.1179/136485908x300805](https://doi.org/10.1179/136485908x300805).