A Retrospective Analysis of Intestinal Parasitic Infection among Patients Attending a Semi-urban Teaching Hospital

Razia Khatoon[1*], Rakesh Kumar Mukhia[1], Noor Jahan [2], Siraj Ahmad[3]
[1]*Department of Microbiology, Hind Institute of Medical Sciences, Sitapur, India*
[2]*Department of Microbiology, Integral Institute of Medical Sciences and Research, Integral University, Lucknow, India.*
[3]*Department of Community Medicine, Integral Institute of Medical Sciences and Research, ntegral University, Lucknow, India.*

Corresponding Author
Razia Khatoon, MD
Tel: +919458212750
Email: drrazia2k19@gmail.com

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Background and study aim: : Intestinal parasitic diseases are quite common especially in developing countries leading to various adverse outcomes in children such as abdominal colic, anemia, mental retardation and reduced physical growth. Therefore, the current study aims to determine the frequency of intestinal parasite infection among patients attending our hospital.

Patients and Methods: A total of 1762 patients whose stool samples were tested in the parasitology laboratory of Microbiology department for routine stool microscopy during the study period of 4 years (January 2016 to December 2019). Stool samples were examined microscopically by direct wet mount and following formalin-ether sedimentation technique.

Results: 334 out of 1762 stool samples revealed presence of parasites, hence, the frequency of intestinal parasitic infection was found to be 18.9%. The commonest parasite identified was Ascaris lumbricoides (37%), followed by Taenia species (16%), and least detected parasite was Enterobius vermicularis (3.5%). Males were infected more (57.5%) as compared to females. Also, mixed parasitic infection was more commonly found in males as compared to females (M: F=5:1).

Conclusion: Intestinal parasitic infection causes severe morbidity especially in children. So, for its effective prevention and control, one needs to impart health education regarding improvement of environmental sanitation, promotion of deworming and maintenance of good personal hygiene.

INTRODUCTION

Intestinal parasitic infection is an important cause of several morbidities in children and high-risk groups including malnutrition, anemia, vitamin A deficiency and growth retardation. The frequency of parasitic diseases depends upon various factors such as poor personal hygiene, poverty, population density, poor sanitation and warm humid tropical climate [1,2]. WHO reported high intensity of intestinal nematode infection amongst 150.9 million people worldwide, while 37.7 million infected people belonged to south East Asia [3]. However, there is reduced prevalence of intestinal parasites in developed countries due to high standard of living and good environmental sanitation.[٤]

Therefore, keeping in view the importance of intestinal parasitic infections in developing countries, the current study was done to determine the frequency of intestinal parasitic infections in general population attending both

outdoor departments (OPD) and admitted patients (inpatient department or IPD) of our institute.

PATIENTS/MATERIALS AND METHODS

Data of all stool samples received during January 2016 to December 2019, at the Parasitology Laboratory of Microbiology Department for routine screening by stool microscopy were analyzed. Stool samples from patients (attending both OPD & IPD) with symptoms suggestive of intestinal parasitic infections were collected and transported to the laboratory as per the standard protocol. Stool samples were observed macroscopically followed by microscopic examination for detection of protozoal trophozoites, helminthic eggs or ova (by preparing saline mount) and cysts (by preparing Lugol's iodine mount). The prepared mount was first observed at 10X followed by 40X of light microscope and the ova, trophozoites & cysts of parasites were identified by their characteristic morphology. Concentration of stool samples was done by formalin-ether sedimentation technique as per CLSI guidelines in samples not yielding parasites on direct wet mounts, especially samples from children with high level of suspicion [5]. The current study was approved by Institutional Ethical Committee. A total of 1762 stool samples were tested in Parasitology laboratory of Department of Microbiology during the study period.

Statistical Analysis:

The collected data was analyzed by IBM SPSS Statistics 22. Frequency and Percentage of variables was calculated. Chi-square test was performed and p value ≤ 0.05 were considered statistically significant .

RESULTS

1762 stool samples were examined in the Parasitology laboratory during the study period, out of which 334 (18.9%) revealed presence of parasites. Figure 1 shows that out of 334 positive cases, majority were OPD patients (N = 250) as compared to IPD patients (N = 84).

As depicted in Table 1, out of 1762 stool samples, majority (30.6%) were processed in year 2017, however, amongst the 334 positive cases, majority (30.5%) were detected in year 2016. Intestinal parasitic infection was found to be more amongst males (57.5%) as compared to females(42.5%)

Table 2 shows that out of 334 positive cases, majority of positivity was detected amongst 21-30 years age group of patients (21.6%), followed by 31-40 years (16.2%) and least positive cases were detected in > 60 years age group of patients (5.4%). However, this difference was statistically insignificant (p= 0.642).

As depicted in Table 3, 60 samples showed mixed or multiple infections (2 or more parasites detected in same stool sample). The M: F ratio for mixed infections was 5:1. Majority of multiple infections were detected in patients belonging to age group of 21-30 years (36.7%), followed by 41-50 years (26.7%) age group patients and least were detected in age groups 11-20 years and > 60 years (3.3% each). This finding was found to be statistically significant ($p < 0.001$) .

Out of 334 positive stool samples, a total of 400 parasites were detected as shown in Table 4. In majority of positive stool samples only single parasitic infection was detected (82.0%). Amongst the multiple infections, majority showed detection of 2 parasites from the same stool sample .(%١٦,٨)

Figure 2 shows the various protozoa and helminths detected from wet mount of stool samples. Table 5 shows that maximum parasites were detected in year 2016 (31.5%, 126 out of 400 parasites) and minimum parasites were detected in year 2018 (20.5%, 82 out of 400 parasites). Ascaris lumbricoides was found to be the most frequently isolated parasite (37.0%), followed by Taenia species (16.0%), and least isolated parasite was Enterobius vermicularis (3.5%).

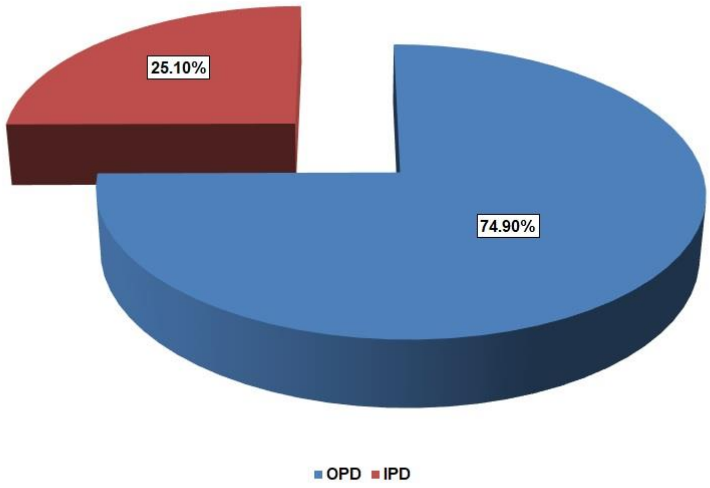

Figure 1: Distribution of positive cases on the basis of their registration status

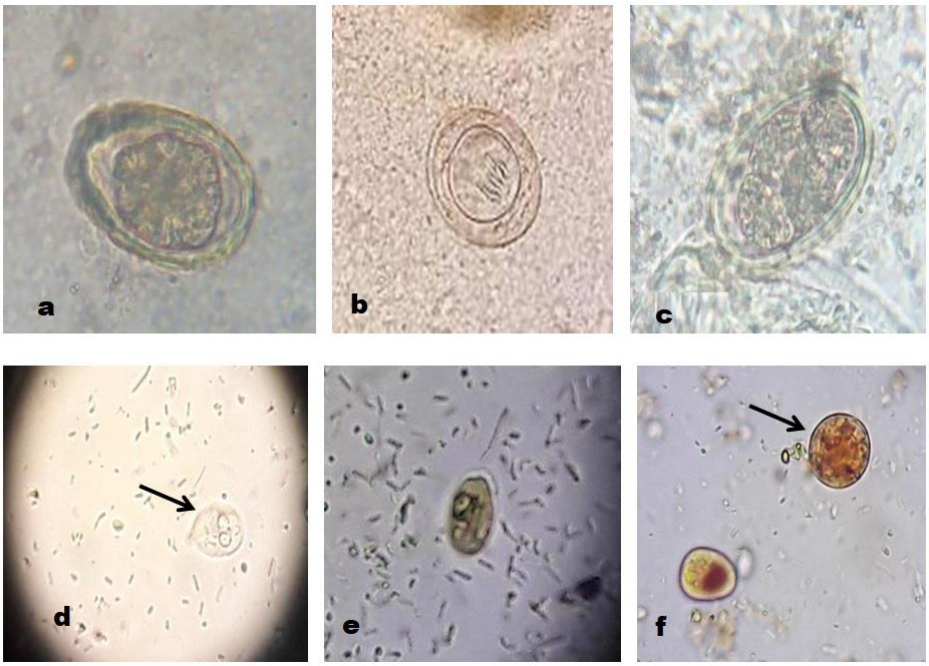

Figure 2: Parasites detected from wet mount of stool samples. A) Egg of Ascaris lumbricoides; B) Egg of Hymenolepis nana; C) Egg of Ancylostoma duodenale; D) Trophozoite of Giardia lamblia (thin arrow); E) Cyst of Giardia lamblia; F) Cyst of Entamoeba histolytica (thin arrow).

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Table 1: Distribution of stool samples according to the year in which the stool samples were processed (N = 1762).				
Year in which stool samples were tested	**Number of stool samples tested**	**Number of positive stool samples**		
		Total (%)	**Male (%)**	**Female (%)**
2016	514	102 (30.5%)	52 (51.0%)	50 (49.0%)
2017	540	88 (26.3%)	60 (68.2%)	28 (31.8%)
2018	334	70 (21.0%)	42 (60.0%)	28 (40.0%)
2019	374	74 (22.2%)	38 (51.4%)	36 (28.6%)
Total	1762	334 (100%)	192 (57.5%)	142 (42.5%)
N = Number of stool samples included in the study.				

Table 2: Distribution of positive stool samples included in the study according to patient's age group and gender (N = 334).				
Age group (in years)	**Gender of patients**			**Chi-Square (χ^2) & *p value**
	Males N (%)	**Females N (%)**	**Total N (%)**	
0-10	34 (17.7%)	18 (12.7%)	52 (15.6%)	**χ^2 = 4.256 p = 0.642**
11-20	26 (13.5%)	22 (15.5%)	48 (14.4%)	
21-30	38 (19.8%)	34 (23.9%)	72 (21.6%)	
31-40	28 (14.6%)	26 (18.3%)	54 (16.2%)	
41-50	34 (17.7%)	18 (12.7%)	52 (15.6%)	
51-60	22 (11.5%)	16 (11.3%)	38 (11.4%)	
>60	10 (5.2%)	8 (5.6%)	18 (5.4%)	
Total	192 (100.0%)	142 (100.0%)	334 (100.0%)	
*** p < 0.05 was considered as statistically significant. N = Number of positive stool samples.**				

Table 3: Age & gender wise distribution of patients with Multiple infections (N = 60).				
Age group (in years)	**Gender of patients**			**Chi-Square (χ^2) & *p value**
	Males N (%)	**Females N (%)**	**Total N (%)**	
0-10	6 (12.0%)	2 (20.0%)	8 (13.3%)	**χ^2 = 36.109 p < 0.001**
11-20	0 (0.0%)	2 (20.0%)	2 (3.3%)	
21-30	20 (40.0%)	2 (20.0%)	22 (36.7%)	
31-40	6 (12.0%)	0 (0.0%)	6 (10.0%)	
41-50	16 (32.0%)	0 (0.0%)	16 (26.7%)	
51-60	0 (0.0%)	4 (40.0%)	4 (6.7%)	
>60	2 (4.0%)	0 (0.0%)	2 (3.3%)	
Total	50 (100%)	10 (100%)	60 (100%)	
*** p < 0.05 was considered as statistically significant. N = Number of positive stool samples showing multiple infections, which means detection of 2 or more parasites in same stool sample.**				

Table 4: Distribution of positive stool samples (N = 334) according to the number of parasites detected in each sample.		
Types of intestinal parasitic infections detected	**Number of positive stool samples N (%)**	**Number of parasites detected N (%)**
Single parasitic infection	**274 (82%)**	**274 (68.5%)**
Two parasitic infections	**56 (16.8%)**	**112 (28.0%)**
Three parasitic infections	**2 (0.6%)**	**6 (1.5%)**
Four parasitic infections	**2 (0.6%)**	**8 (2.0%)**
Total	**334 (100%)**	**400 (100%)**

Table 5: Distribution of parasites in stool samples according to the year of detection (N = 400).					
Parasites detected in Stool Samples	**Year in which parasites in stool samples were detected**				
	2016 N (%)	**2017 N (%)**	**2018 N (%)**	**2019 N (%)**	**Total N (%)**
Entamoeba histolytica	10 (7.9%)	8 (7.7%)	6 (7.3%)	4 (4.5%)	28 (7.0%)
Giardia lamblia	8 (6.3%)	24 (23.1%)	12 (14.6%)	6 (6.8%)	50 (12.5%)
Ascaris lumbricoides	44 (34.9%)	34 (32.7%)	36 (43.9%)	34 (38.6%)	148 (37.0%)
Ancylostoma duodenale	18 (14.3%)	8 (7.7%)	8 (9.8%)	14 (15.9%)	48 (12.0%)
Taenia species	36 (28.6%)	6 (5.8%)	6 (7.3%)	16 (18.2%)	64 (16.0%)
Enterobius vermicularis	4 (3.2%)	4 (3.8%)	2 (2.5%)	4 (4.5%)	14 (3.5%)
Hymenolepis nana	6 (4.8%)	20 (19.2%)	12 (14.6%)	10 (11.5%)	48 (12.0%)
Total	126 (100%)	104 (100%)	82 (100%)	88 (100%)	400 (100%)
N = Number of parasites detected in positive stool samples.					

DISCUSSION

Intestinal parasitic diseases are predominantly seen in developing countries. The prevalence of intestinal parasitic infections indirectly reflects the local sanitation and living conditions of the people of that country therefore, it varies from one country to another .

In the current study the frequency of intestinal parasitic infections was 18.9%. Our finding is in agreement with a previously done study which reported prevalence of parasitic infections of 20% in rural areas of Lucknow [6]. A study from Karnataka reported prevalence of intestinal parasitic infections to be 24.78% [7]. Another study from Southern Delhi reported prevalence of 26.1% (759 positive out of 2907 stool samples tested) [8]. However, a study from Himachal Pradesh reported a very high prevalence of intestinal parasitic infection to be 47.08% [9] .

Our study reported that males were more commonly infected with intestinal parasites (57.5%) as compared to females (42.5%). The reason for this male preponderance could be due to their daily outdoor activity, hence, predisposing them to exposure to the soil transmitted parasites. A study from Rohtak reported higher rate of parasitic infection among males (68%) as compared to females (31.9%) [10]. Another study from Rajasthan also reported higher rate of infection amongst male patients (56.52 %) as compared to female patients (46.78 %) [11]. Yet another study from Gulbarga, Karnataka, reported higher parasitic infection rate among males (33.39%) as compared to females (21.29%) [12]. These were in concordance with our study. However, in contrast to our finding, many other studies reported higher rates of parasitic infections in females as compared to males [13-17]. This could be due to difference in the geographical areas of study.

In the present study, maximum cases of parasitic infection was detected among young patients belonging to age group 21-30 years and least number of cases were seen in older patients belonging to age group > 60 years. However, a study from Karnataka reported that maximum cases belonged to children ageing 5-10 years (66.66%) and least number of cases (13.38%) were detected among patients who were < 5 years [12]. This could be difference in the age groups included in the study.

In our study, multiple infections were seen more in males than females. The M: F ratio for mixed infestations was found to be 5:1. Most of the cases of multiple infections were seen in patients belonging to age group 21-30 years (36.7%) and least were detected in age groups 11-20 years and > 60 years (3.3% each). In contrast to our findings, a study from Rajasthan reported that multiple infections were seen more in patients belonging to age group 11-15 years [11]. This could be due to difference in the climatic conditions in the study area .

Our study reported that Ascaris lumbricoides was the most frequently detected parasite (37.0%), followed by Taenia species (16.0%). Other helminths detected were Ancylostoma duodenale (12%), Hymenolepis nana (12%) and Enterobius vermicularis (3.5%). Protozoan parasites were less frequently detected including Entamoeba histolytica (7.0%) and Giardia lamblia (12.5%). In contrast to our findings, a study from Rohtak reported that protozoan parasites were the most frequently detected parasites including Giardia lamblia (58.5%) and Entamoeba histolytica (32.0%) [10]. Another study from Rajasthan also reported maximum infection (23.66%) of protozoan parasites as compared to helminthes (14.73%) [11]. A study from Karnataka, reported Entamoeba histolytica (65.57%) as the most frequently detected parasite followed by Ascaris lumbricoides (12.68%) [12].

CONCLUSION

The frequency of intestinal parasitic infection among patients who attended our hospital was found to be 18.9%. This could be due to prevalence of unhygienic conditions, non-availability of potable water and malnutrition among the study population. Therefore, to effectively control intestinal parasitic infection the general population should be made aware about the importance of good environmental sanitation, consumption of safe drinking water, proper cooking of food, periodic deworming, maintenance of personal hygiene, and avoidance of bare foot walking on soil.

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Conflict of Interest: None.

Ethical approval: Approved by the Ethics committee of HIMS, Sitapur. No. IEC/IRB No:HIMS/IRB/2019-20/17.

HIGHLIGHTS

- The frequency of intestinal parasitic infections amongst patients included in our study was found to be 18.9%.
- Males were infected more (57.5%) as compared to females.
- The commonest parasite identified was Ascaris lumbricoides (37%), followed by Taenia species (16%).

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