The Pharma Innovation Journal 2018; 7(9): 343-347

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(9): 343-347

www.thepharmajournal.com
Received: 21-07-2018
Accepted: 23-08-2018

Ashok Kumar Sah
a) School of Life and Allied Health Science, Glocal University Saharanpur, Uttar Pradesh, India
b) Department of Medical Laboratory Technology, Amity Medical School, Amity University Haryana, Gurgaon, Haryana, India

Suresh Jaiswal
School of Health and Allied sciences, faculty of Health Sciences, Pokhara University, Kaski, Nepal

M Vijayasimha
Department of Medical Laboratory Technology, Amity Medical School, Amity University Haryana, Gurgaon, Haryana, India

Correspondence
Ashok Kumar Sah
a) School of Life and Allied Health Science, Glocal University Saharanpur, Uttar Pradesh, India
b) Department of Medical Laboratory Technology, Amity Medical School, Amity University Haryana, Gurgaon, Haryana, India

Impact of human intestinal parasitic infection on people of Dehradun, Uttarakhand, India

Ashok Kumar Sah, Suresh Jaiswal and M Vijayasimha

Abstract
Intestinal parasites are important causes of health problem worldwide. Although they affect patients of unhygienic, and malnourishment and incapacitation due to their actions particularly in children as compared to adults is significant. This study was designed to find out the distribution of intestinal parasites in different places of Dehradun. Among the 759 patients carried for stool examination for detection of the intestinal parasites in which 375(49.4%) were female and 384(50.6%) were male. Out of 759 samples collected, 264 samples were positive. In this study, age groups classified as less than 20 years were 316 (41.6%), age groups 20-50 were 400 (52.7%) and age group more than 50 were 43 (5.7%) out of which (34.8%) were positive and (65.2%) were negative. Distribution of parasites were as *Ancylostoma duodenale* 6(0.8%), *Ascaris lumbricoides* 50(6.58%), *Entamoeba histolytica* 52(6.9%), *Giardia lamblia* 81(10.7%), *Hymenolepis nana* 22(2.9%), *Strongyloids stercoralis* 16(2.1%), *Taenia* species 18(2.4%) and *Trichuris trichuria* 19(2.5%). This parasitic infection could have avoided by improving awareness, health education and hygiene practices. However, the examination of personal hygiene, as well as routine medical examination and treatment, is strongly recommended in these areas to control these parasites.

Keywords: Intestinal parasites, protozoa, helminthes, stool examination

1. Introduction
Parasitic infections caused by protozoa and helminthes are major global health problems. The prevalence of parasitic infections varies with the level of hygiene and sanitation and is generally higher in the tropics and sub-tropics than in more temperate climates [1-3]. In addition, poverty, malnutrition, high population density, the unavailability of potable water, low health status and a lack of personal hygiene provide optimal conditions for the growth and transmission of intestinal parasites. Other barriers to decreasing the rates of parasitic infections include insufficient parasitic disease research, neglect of the problem in developing countries and a lack of follow-up of treatments [4].
In India prevalence of intestinal parasites reported from different scientific reports showed a wide variation of incidence due to a different time, place and method used [5]. The frequency and incidence of intestinal parasites also vary with age, sex, and geography [6].
The most common parasitic infestations reported globally are *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Trichuris trichiuria* and *Entamoeba histolytica* [7]. The WHO estimates that approximately 50 million people worldwide endure insidious amoebic infection, resulting in 40-100 thousand yearly deaths. Present estimate proposes that *Ascaris lumbricoides* can infest more than 1 billion and *Trichuris trichiuria* and hookworms can infest 795 and 740 million people, respectively [8]. In India, the overall prevalence rate of intestinal parasitic infestation ranges from 12.5% to 66%, with varying prevalence rate for individual parasite [9].
This study was undertaken to know the prevalence of intestinal parasitic infections and the influence of age and sex on the prevalence of infections among the patients attending a tertiary care hospital at Dehradun, Uttarakhand, India.

2. Methodology
2.1. Study Area: This study was conducted in main Rajpur Road, Ghantaghar, Premnagar, Chachhrata Road, Subhasnagar, and other places in Dehradun, Uttarakhand.
2.2. Study Design: A cross sectional study was conducted between September 2016 to June 2017 with the cooperation of local community and District medical office (DMO),

Andannagar, Dehradun which possess the record for each member in the area. Writtenconsent was obtained from each individual before the study. Fresh stool samples were collected and the individuals were also interviewed about their economic background, health status, toilet facilities, water facilities, local treatments, and previous parasitic infections.

2.3. Collection of Samples: Sample collection in standard way is important technique for finding and identification of intestinal parasites. A small clear capped plastic container with a wooden stick was provided to every participant who wishes to participate in the research. The next day samples were collected and brought to the laboratory for parasitological processing and investigation of stool sample. The entire specimens were correctly labeled with the individual sample number, date, and area. The patients have highly infectious infections like HIV; Hepatitis excluded in the study and all others sample were included in the study.

2.4. Preservation of Samples: After the specimens were received in the laboratory, saline, iodine wet mount, and other staining techniques were performed. The unprocessed specimens were preserved with 10% formalin and concentration techniques like sedimentation and floatation were performed. Preservation of fecal specimens is necessary to maintain protozoan morphology and also to avoid further development of helminthic eggs to larvae and further.

2.5. Microscopic Examination Methods: The identification of intestinal parasites was performed by using a binocular microscope under 10 X and 40 X.

2.6. Saline and Iodine Wet Mount: Approximate 2 mg of stool sample was picked up using a wooden stick and mixed with a drop of normal saline (0.9% NaCl) on a glass slide with applicator stick. If it was a formed stool, materials were taken from well inside the sample to look for parasite eggs. The preparation was covered with a cover slip and examined under the microscope.

For iodine wet mount preparation, around 2 mg of stool sample was pulled out by a wooden stick and mixed with a drop of Lugol's iodine. It was covered with a cover slip and examined under the microscope.

2.7. Floatation Techniques: 1 ml of stool sample was mixed with few drops of salt solution and was stirred continuously to make suspension. More salt solution was added to fill the container. Crude matter, which was floated, was removed. The container was placed on a level surface and the final filling of the glass container until a convex meniscus was formed. A glass slide was carefully laid on top of the container so that its center was in contact with the fluid. The preparation was allowed to stand for 20–30 minutes after which the glass slide was quickly lifted, turned over, smoothly so as to prevent spillage of the liquid, and examined under the microscope.

2.8. Zinc Sulphate Centrifugal Floatation: A fine stool suspension was made by mixing 1 g of stool and 10 ml of lukewarm ionized water. The coarse particles were removed by straining through a wire gauge. The filtrate was collected in a tube and centrifuged for 1 minute at the rate of 2500 rpm. The supernatant fluid was poured off and distilled water was added to the sediment. It was shaken well and centrifuged and the procedure was repeated two to three times until the supernatant fluid became clear, which was then poured off. 3-4 ml of a 33% zinc sulphate was added to the sediment. The sediment was stirred and further zinc sulphate solution was added to fill the tube up to the top and centrifuged again for at least 1 minute at 2500 rpm. The surface film was then removed by a loop on to a glass slide, covered by a coverslip, and observed under the microscope.

2.9. Data analysis: Clinical data from each patient were collected by using a questionnaire and statistical analysis was performed with MS Excel and SPSS 16.0.0

3. Results: 759 people screened for stool examination for detection of intestinal parasites of which 375 (49.4%) were female and 384(50.6%) were male. Classification was done by age group as less than 20 years were 316 (41.6%), 20-50 were 400 (52.7%) and >50 were 43(5.7%). Out of 759 samples, 264 (34.8%) were parasites positive and 495 (65.2%) were negative as shown (in table 1 and figure 1). Distribution of parasites were *Ancylostoma duodenale* 6 (0.8%), *Ascaris lumbricoides* 49 (6.58%), *Entamoeba histolytica* 52 (6.9%), *Giardia lamblia* 81 (10.7%), *Hymenolepis nana* 22 (2.9%), *Strongyloids stercoralis* 16 (2.1%), *Taenia* species 18(2.4%) and *Trichuris trichuria* 19(2.5%) as shown in fig 2.

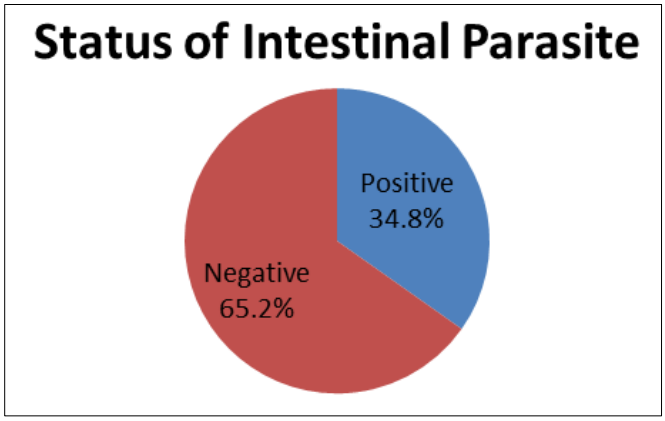

Fig 1: Status of intestinal parasites

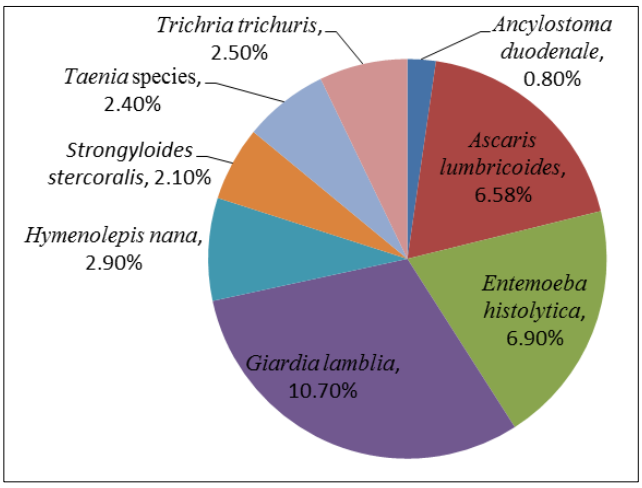

Fig 2: Distribution of intestinal parasites.

Table 1: Shows socio- demography and status of participants

Variables	Frequency(n)	Percentages (%)
Age category (yrs)		
Less than 20	316	41.6
20-50	400	52.7
More than 50	43	5.7
Total	759	100
Sex		
Female	375	49.4
Male	384	50.6
Total	759	100
Number of patients per month (September 2016 to June 2017)		
January	52	6.9
February	12	1.6
March	51	6.7
April	94	12.4
May	150	19.8
June	122	16.1
September	18	2.4
October	12	1.6
November	200	26.4
December	48	6.3
Total	759	100
Diagnosis of parasites		
Ancylostma duodenale	6	0.8
Ascaris lumbricoides	49	6.5
Entemoeba histolytica	52	6.9
Giardia lamblia	81	10.7
Hymenipepis nana	22	2.9
Stronglyloids stercoralis	16	2.1
Taenia speces	18	2.4
Trichuris trichuria	19	2.5
Not Found	495	65.2
Total	759	100

Table 2: Association of parasites with Age

Diagnosis	Age categories			Total	Chi-Square	P Value
	>20	20-50	<50			
Ancylostma duodenale	3(50.0%)	3(50.0%)	0(0.0%)	6(100.0%)	31.117	0.028
Ascaris lumbricoides	21(42.9%)	26(53.1%)	2(4.1%)	49(100.0%)		
Entamoeba histolytica	25(48.1%)	23(44.2%)	4(7.7%)	52(100.0%)		
Giardia lamblia	46(56.8%)	34(42.0%)	1(1.2%)	81(100.0%)		
Hymenolepis nana	9(40.9%)	11(50.0%)	2(9.1%)	22(100.0%)		
Trichuris trichuria	5(26.3%)	13(68.4%)	1(5.3%)	19(100.0%)		
Stronglyloids stercoralis	5(31.2%)	11(68.8%)	0(0.0%)	16(100.0%)		
Taenia speces	2(11.1%)	12(66.7%)	4(22.2%)	18(100.0%)		
Not Found	199(40.2%)	267(53.9%)	29(5.9%)	495(100.0%)		
Total	316(41.6%)	43((5.7%)	400(52.7%)	759(100.0%)		

Table 3: Association of parasites distribution with sex

t	Sex		Total	Chi-Square	P value
	F	M			
Ancylostma duodenale	**2(33.3%)**	**4(66.7%)**	**6(100.0%)**	18.590	0.029
Ascaris lumbricoides	22(44.9%)	27(55.1%)	49(100.0%)		
Entamoeba histolytica	25(48.1%)	27(51.9%)	52(100.0%)		
Giardia lamblia	43(53.1%)	38(46.9%)	81(100.0%)		
Hymenolepis nana	15(68.2%)	7(31.8%)	22(100.0%)		
Trichuris trichuria	7(36.8%)	12(63.2%)	19(100.0%)		
Stronglyloids stercoralis	10(62.5%)	6(37.5%)	16(100.0%)		
Taenia speces	2(11.1%)	16(88.9%)	18(100.0%)		
Not Found	249(50.3%)	246(49.7%)	495(100.0%)		
Total	375(49.4%)	384(50.6%)	759(100.0%)		

Table 4: Association of parasites with month wise

Diagnosis	Month										Total	Chi-Square	P Value
	April	December	February	January	June	March	May	November	October	September			
Ancylostma duodenale	1(16.7%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(16.7%)	2(33.3%)	2(33.3%)	0(0.0%)	0(0.0%)	6(100.0%)	70.785	0.784
Ascaris lumbricoides	8(16.3%)	4(8.2%)	0(0.0%)	2(4.1%)	9(18.4%)	4(8.2%)	10(20.4%)	11(22.4%)	0(0.0%)	1(2.0%)	49(100.0%)		
Entamoeba histolytica	6(11.5%)	2(3.8%)	0(0.0%)	2(3.8%)	9(17.3%)	4(7.7%)	13(25.0%)	15(28.8%)	1(1.9%)	0(0.0%)	52(100.0%)		
Giardia lamblia	12(14.8%)	6(7.4%)	2(2.5%)	5(6.2%)	15(18.5%)	5(6.2%)	14(17.3%)	17(21.0%)	2(2.5%)	3(3.7%)	81(100.0%)		
Hymenolepis nana	5(22.7%)	2(9.1%)	1(4.5%)	2(9.1%)	3(13.6%)	1(4.5%)	3(13.6%)	4(18.2%)	1(4.5%)	0(0.0%)	22(100.0%)		
Trichuris trichuria	1(5.3%)	0(0.0%)	1(5.3%)	0(0.0%)	3(15.8%)	1(5.3%)	6(31.6%)	7(36.8%)	0(0.0%)	0(0.0%)	19(100.0%)		
Stronglyloids stercoralis	3(18.8%)	0(0.0%)	1(6.2%)	0(0.0%)	4(25.0%)	1(6.2%)	3(18.8%)	3(18.8%)	1(6.2%)	0(0.0%)	16(100.0%)		
Taenia speces	3(16.7%)	0(0.0%)	0(0.0%)	3(16.7%)	0(0.0%)	4(22.2%)	2(11.1%)	5(27.8%)	1(5.6%)	0(0.0%)	18(100.0%)		
Not Found	55(11.1%)	34(6.9%)	7(1.4%)	37(7.5%)	79(16.0%)	30(6.1%)	97(19.6%)	136(27.5%)	6(1.2%)	14(2.8%)	495(100.0%)		
Total	94(12.4%)	48(6.3%)	12(1.6%)	52(6.9%)	122(16.1%)	51(6.7%)	150(19.8%)	200(26.4%)	12(1.6%)	18(2.4%)	759(100.0%)		

4. Discussion

Intestinal parasites constitute a major health problem in many developing countries, predominantly due to poor sanitation and inadequate personal hygiene.

In our study, the overall prevalence rate of intestinal parasitic infections was 34.8%, which was higher than previous reports from other countries. Other developing regions, such as Iran, northern Lebanon, Brazil, Nepal, Malaysia, and Saudi Arabia, have reported prevalence values ranging from 19.3% to 70% [4, 10-15]. Various studies to reveal the prevalence rate of intestinal parasites in both healthy and symptomatic populations in rural and urban India have reported the prevalence rate to vary from 11.50% to 97.4% [3, 16-19]. This wide variation among studies could be attributed to the time and period of the study, the age of the study population, variations in diet, habits and occupations, different sampling techniques and research methodologies, geographical differences and the inclusion of non-pathogenic intestinal parasites in the analysis.

5. Conclusion

This study demonstrates that intestinal parasite infections are a public health problem in our study population. Poor sanitation, health education, and inadequate environmental conditions constituted the main determining factors that predisposed this population to intestinal parasites.

Improvements in sanitation, limiting open-air defecation, street foods, and hygiene and health education are the required interventions that will be instrumental in preventing these infections. Furthermore, mass deworming programs are highly recommended, as this population can be easily accessed for treatment.

6. Acknowledgment

The authors are grateful to the local community and DMO-District medical office, Chandannagar, Dehradun, for their kind support in the shaping of the work. All over the authors are highly grateful to the participants who participated in the study by providing the sample.

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