

Prevalence of Intestinal parasites at a Tertiary Care Centre at the Foothills of Himalayas, Srinagar, Uttarakhand, India: A six-year Observational Study.

Yogendra Pratap Mathuria¹, Archana Singh²

¹Associate professor, Department of Microbiology, Government Doon Medical College, Dehradun.

²Assistant Professor, Department of Surgery, Uttarakhand Ayurvedic University, Harrawala, Dehradun.

Received: May 2019

Accepted: May 2019

Copyright: © the author(s), publisher. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Intestinal parasitic infections is a serious public health problem in most of the regions of the world, especially in developing countries, and represents a major cause of morbidity and mortality in children and among high-risk groups. **Aims:** To find out the prevalence of intestinal parasitic infections in Garhwal region of Uttarakhand and compare and correlate it with gender, age group and area (rural or urban). **Methods:** The collected stool samples were subjected to routine stool investigations during the study, i.e. Macroscopic examination was carried out for the presence adult worms or their body segments and microscopic examination such as stool wet mounts (both saline and iodine mounts); modified acid-fast staining for Cryptosporidium and Isospora and ELISA for Cryptosporidium were done. **Results:** Out of total 3614 patients, 197 (5.45%) (excluding Cryptosporidium) and 338(9.35%) (Including Cryptosporidium), while 141(3.90%)(only Cryptosporidium)had parasitic infection. Maximum numbers (average) of patients were enrolled in month of May (102, 16.94%) and June (87, 14.45%). Maximum number of patients were in the age group of 1-10yrs (949, 26.26%) whereas out of these 110 patients were found positive (11.6%). On the other hand, out of 343 patients in 11-20yrs age group, 46 (13.4%) were found positive and least number of patients were from <1year age group. Mostly male patients were affected by parasitic infections (60.06%). Parasite most commonly isolated was Cryptosporidium 141(41.72%), followed by Giardia lamblia 74(21.89%) and hookworm 40(11.83%). One cases each of trematodes, Fasciola hepatica (both ova and adult) and Clonorchis (ova) whereas two cases of Isospora belli were also seen. **Conclusion:** Prevalence of intestinal parasites (9.35%) is low in Garhwal region of Uttarakhand.

Keywords: ELISA, Formol-ether concentration technique, modified acid-fast staining.

INTRODUCTION

Intestinal parasitic infections is a serious public health problem in most of the regions of the world, especially in developing countries, and represents a major cause of morbidity and mortality in children and among high-risk groups.^[1] The frequency and incidence of Intestinal parasites also varies with age, sex and geography WHO Global Burden of Disease 2004 report suggests that approximately 150.9 million people worldwide has high intensity infection by intestinal nematodes while 37.7 million people alone from south East Asia are infected.^[2,3] In India, prevalence of intestinal parasites reported from different workers shows wide variations from 5.56% to 90%.^[4-9]

Intestinal helminths hardly ever cause death but have high morbidity, thus chronic and subtle effects on health and nutritional status of the host,^[10,11] they also damage physical and mental development of children, prevent educational achievement, and hamper economic development.^[12,13]

Helminths such as *Ascaris lumbricoides*, hookworm, *Enterobius vermicularis* and protozoa like *Entamoeba histolytica* and *Giardia lamblia* are some of the common intestinal parasites responsible for considerable morbidity in young and adult population.^[14]

Veer Chander Singh Garhwali Government Medical Science and Research Institute, (VCSGGMS&RI) Srikot, Srinagar (located at 30°13'N 78°47'E / 30.22°N 78.78°E / 30.22; 78.78) is one of the referral centres for Garhwal region and is closest referral center from Chamoli, Tehri, Rudraprayag and Pauri districts. This study was undertaken to comprehend the prevalence of parasitic infections and to know whether age and sex influence the prevalence or infections among the patients

Name & Address of Corresponding Author

Yogendra Pratap Mathuria
Associate professor,
Department of Microbiology,
Government Doon Medical College,
Dehradun.

attending a tertiary care teaching hospital at foothills of Himalayas, in Garhwal, Uttarakhand.

MATERIALS AND METHODS

This hospital based study of six years period (January 2010 – December 2015) was carried out in Parasitology section of department of Microbiology, VCSGGMS&RI, situated at the foothills of the Himalayas, along the river Alaknanda (River Ganga’s tributary) in the valley of Srinagar, Garhwal, Uttarakhand, India.

A total of 3614 clinically suspected, randomly selected cases of parasitic gastroenteritis of all age groups and both sexes coming to out – patient departments of VCSGGMS&RI were studied. History was taken in relation to name, age, address and area (rural-urban). Patients under antihelminthic treatment were excluded from the study group.

The stool samples were collected from the suspected patients and were subjected to routine stool investigations during the study, i.e. Macroscopic examination was carried out for the presence adult worms or their body segments and further microscopic methods such as stool wet mounts (both saline and iodine mounts) were made after Formol-ether concentration technique; modified acid-fast staining and ELISA (Antigen detection Microwell ELISA, research, Inc. Carlsbad) for cryptosporidium were done.

RESULTS

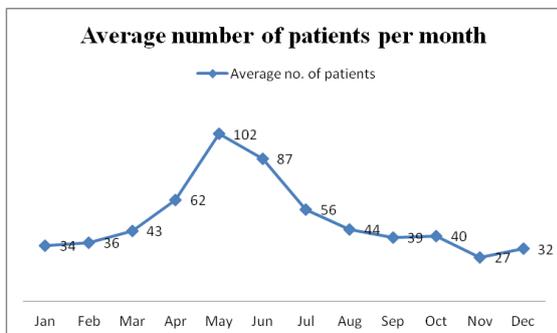


Figure 1: Monthwise average number of patients

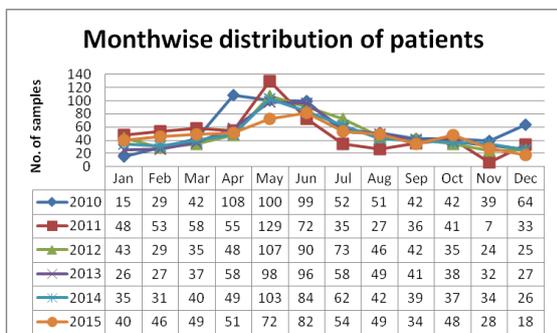


Figure 2: Monthwise distribution of patients

A total of 3614 stool samples from clinically suspected patients of gastro-enteritis were included

in the study. Maximum number of patients (average) were seen in the month of May (102, 16.94%), followed by June (87, 14.45%), while minimum number of patients were seen in the months of November (27, 4.48%), December (32, 5.32%) and January (34, 5.65%). [Figure 1 & 2]

Table 1: Isolated parasites from urban and rural areas

Protozoa	Total	Urban	Rural
Entamoeba histolytica	30	18	12
Giardia lamblia	74	41	33
Helminths:			
Nematodes:			
Ascaris	21	12	9
Hookworm	40	9	31
Entobius vermicularis	2	1	1
Strongyloides larvae	5	0	5
Cestodes:			
Hymenolepis nana	20	7	13
Taenia spp.	1	1	0
Trematodes			
Fasciola hepatica	1	0	1
Clonorchis spp.	1	0	1
Coccidioides			
Cryptosporidium parvum	141	65	76
Isospora belli	2	2	0
Total	338	156	182
Mixed Infections:			
2 parasites	12	3	9
3 parasites	1	0	1

Out of 3614 patients, 338(9.35%) (Including Cryptosporidium), 197 (5.45%) (excluding Cryptosporidium) and 141(3.90%)(only Cryptosporidium) patients were found to be positive for parasitic infections. Parasite most commonly isolated was Cryptosporidium 141(41.72%), followed by Giardia lamblia 74(21.89%) and hookworm 40(11.83%). Among 104 cases of protozoal parasites, Giardia lamblia 74(71.15%) was commonest isolate, followed by Entamoeba histolytica 30(28.85%). Whereas among 91 cases of Helminths, Hookworm 40 (43.96%) was the commonest isolate, followed by Ascaris lumbricoides 21(23.08%) and Hymenolepis nana 20 (21.98%), and larvae of Strongyloides 5(5.49%) [Figure 4]. Among trematodes-one case each of Fasciola hepatica [Figure 3] and Clonorchis were also isolated, and among Coccidioides, two cases of Isospora were also seen.

Mixed parasitic infection were also seen in 13 patients, two parasites were isolated from 12 patients (M: F:: 9:3) and three parasites were isolated from single female patient.

Besides ova and cysts of most parasites, larvae of Strongyloides (5 cases), trophozoites of Giardia (4 cases) and adult worms of Ascaris lumbricoides, Enterobius vermicularis and Fasciola hepatica were also isolated in this study. [Table 1, 2]

The ratio of patients from Urban: Rural was 1:1.17. [Table 1]

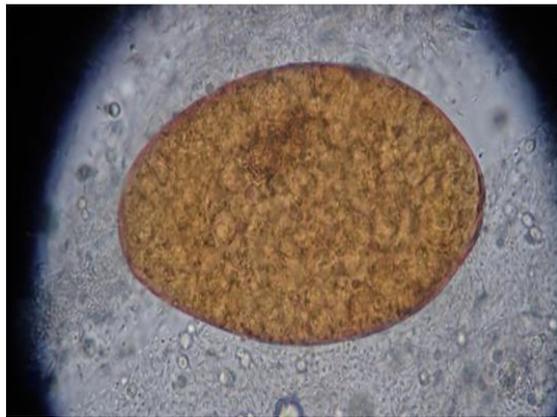


Figure 3: Ova of Fasciola hepatica(100x)

Parasitic infections were more common in Males, 203(60.06%) as compared to females 135(39.94%).Maximum number of parasites were isolated in year 2012 (78, 23.1%) and least in year 2010 (33, 9.76%). [Table 2]



Figure 4: larva of Strongyloides stercoralis(40x)

On the analysis of age group of infected patients and the prevalence of parasitic infection, it has been observed that maximum number of patients were in the age group of 1-10yrs (949,26.26%) whereas out of these110 patients were found positive(11.6%). On the other hand, out of 343 patients in 11-20yrs age group,46 (13.4%) were found positive and minimum number of positive cases were in less than 1year age group, (9,1.1%) followed by more than 70yrs age group (7,7.4%). [Figure 5]

Table 2: Year-wise Relationship between gender and isolated parasites.

Parasites	Years	2010			2011			2012			2013			2014			2015			Total
		Total	M	F																
Protozoa																				
	Entamoeba histolytica	12	8	4	2	2	0	3	2	1	2	1	1	6	4	2	5	4	1	30
	Giardia lamblia	5	4	1	22	1	7	19	1	3	3	2	1	13	8	5	12	4	8	74
Helminths																				
Nematodes																				
	Ascaris	0	0	0	7	4	3	7	5	2	2	2	0	4	2	2	1	0	1	21
	Hookworm	7	1	6	7	4	3	11	2	9	2	2	0	6	2	4	7	0	7	40
	Entobius vermicularis	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	2
	Strongyloides larvae	0	0	0	1	1	0	2	1	1	2	1	1	0	0	0	0	0	0	5
Cestodes																				
	Hymenolepis nana	1	0	1	11	8	3	6	5	1	0	0	0	2	1	1	0	0	0	20
	Taenia spp.	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Trematodes																				
	Fasciola hepatica	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1
	Clonorchis spp.	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Coccidioids																				
	Cryptosporidium parvum	8	3	5	12	7	5	29	1	1	23	1	9	28	1	1	41	2	1	141
	Isospora belli	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Male			1			4			5			2		3				3		203
Female			6			3			1			3		6				4		135
				1			2			2			1			2			3	
				7			1			7			2			6			2	
Total		33			64			78			35			62			66			338
Mixed Infection																				
2 parasite s		0	0	0	5	4	1	5	4	1	0	0	0	1	0	1	1	1	0	12
3 parasite s		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1

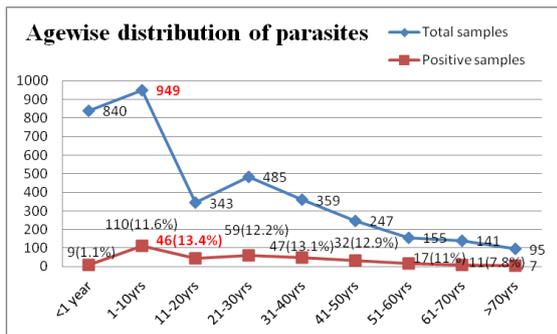


Figure 5: Distribution of parasites in different agegroups.

DISCUSSION

Stool examination for parasitic ova, cysts, trophozoite and larvae remains the gold standard for laboratory diagnosis for IPI's.^[15] Lack of knowledge of prevalence of parasites in a particular geographic area may lead to misdiagnosis of IPI's as appendicitis and other inflammatory bowel diseases.^[16] Only 338 cases were found positive out of suspected 3614 cases of intestinal parasitic infections, thus the prevalence rate of intestinal parasites in this study was 197 (5.45%) (excluding Cryptosporidium), 9.35% (Including Cryptosporidium) and prevalence of Cryptosporidium species was 3.90% (141 isolates). Various studies from rural and urban regions have shown different prevalence rates ranging from 5.56% to 46.7%.^[4,17] Only two studies, one from Surat, Gujrat,^[4] and other from Rohtak, Haryana showed prevalence lower than this study (9.35%, Including Cryptosporidium),^[18] but they had not included Cryptosporidium in their studies, thus the comparative prevalence in this study without Cryptosporidium cases is 5.45%, which is lower than the other studies in India. This might be due to improved sanitary practices, reduced slum areas, personnel hygiene, increased awareness, health education, extreme seasonal variations and geographical area.

We have observed seasonal variation in suspected parasitic infestation in the Garhwal region of Uttarakhand, but none of the other studies showed significant variation in patient's number according to season and months.^[18-21] [Figure 1, 2]

In this study, we observed more positive cases in male patients than the female (Male : Female ratio: 1.5:1) [Table 2] which is in concordance with studies at Rohtak, Haryana and other studies,^[18,22,23] while female predominance is also seen in many studies.^[4,19,21] This high Male: Female ratio may be because females in rural area avoid visiting health facilities until their condition begins affecting their work and home made remedies have failed to provide relief.

Age range of patients varied from 1 month to 81 years. Maximum prevalence was in the age group of

11 – 20 years (13.4%) [Figure 3], which is in concordance with other studies.^[22,24] The reason of high prevalence in this group may be their more active life style and involvement in outdoor activities. Maximum numbers of positive cases were seen in the age group of 1-10yrs, which is also seen in most of the studies [Figure 5].^[4,17,19,25]

Prevalence rate was higher in rural population which is in concordance other studies from Madhya Pradesh,^[19] and Karnataka.^[26] This could be due to low socio-economic conditions and Literacy rates prevailing in rural areas.

Amongst Coccidian parasites, Cryptosporidium was the most common isolate in this study with prevalence rate of 3.9%, which was in concordance with most of the studies but lower than study from south India and Delhi.^[27-33] Prevalence of Intestinal parasites is quite low in Garhwal region of Uttarakhand because of relatively cold climate conditions, high temperature variation, i.e. warm and humid days despite cold nights due to proximity with river. Most of the other studies showed either Entamoeba histolytica or Giardia lamblia as the commonest isolates.^[4,17-21]

Giardia was the second commonest isolated parasite and the commonest protozoan in this study, its prevalence was 2.05% in all patients, and was 21.9% of all isolates, was in concordance with study at Bihar,^[7] but lower than other studies.^[4,19]

Trematodes such as Fasciola hepatica (both ova and adult) [Figure 3 & 4] and Clonorchis (ova only) were isolated in this study. None of the studies related to stool examination in India showed any trematodes among the isolates.

CONCLUSION

Prevalence of Intestinal parasites is quite low in Garhwal region of Uttarakhand because of relatively extreme climate conditions, high literacy rate, proper drinking water supply and good sanitation. Protozoa and nematodes are most common intestinal parasites in most places, coccidians like Cryptosporidium are also common but not routinely tested. Trematodes such as Fasciola hepatica and Clonorchis were also isolated in the study which are not common isolates in stool examination, thus it is of immense importance to accurately diagnose the infestation case as treatment differs for different groups.

Further research on pattern of zoonotic parasites found in wild animals at different places, therapeutic efficacy of different drugs in treatment of different groups of parasites, presence of asymptomatic intestinal parasitic infection in random people not visiting OPD will help make the results more applicable to general population. Research on hygiene habits of different age groups and occupation in relation to intestinal parasitic infection will help better direct awareness programmes.

REFERENCES

- Kang G, Methew MS, Rajan S, Daniel JD, Mathan MM, Muliylil JP. Prevalence of intestinal parasites in rural india. *Tropical med and international health* 1998; 3(1): 70-5.
- Ahsan-ul-Wadood, Bari A, Rhman A, Qasim KF. Frequency of Intestinal Parasites Infestation in Surat City of South Gujarat. A Hospital Based Study. *Natl J Community Med* 2014; 5(3):273-5
- Sethi S , Sehgal R, Malla N, Dudey ML, Mahajan RC(2000). Changing trends of intestinal parasitic infections in Chandigarh (Northern India): Hospital based study. *Ind. J. Med. Microbiol.*, 18: 106-109.
- Rao VG, Aggrawal MC , Yadav R, Das SK, Sahare LK, Bondley MK, Minocha RK (2003). Intestinal parasitic infections, anaemia and undernutrition among tribal adolescents of Madhya Pradesh. *Ind. J.Community Med.*, 27: 26-29.
- Kumar R., Biswas P.P., Yasmin T., Sen A., Ganguly U. Prevalence of Intestinal Parasitic Infections in Patients Attending a Tertiary Care Hospital in Eastern Bihar. *Journal of Evolution of Medical and Dental Sciences* 2014; Vol. 3, Issue 24, June 16; Page: 6740-6746,
- Patel JC (1986). Ten year study of stool samples with particular reference to intestinal parasites. *J. Postgrad. Med.*, 32: 219-224
- Hedge GR, Patel JC (1986). Prevalence of intestinal parasitic infestation in rural area. *J. Postgrad. Med.*, 32: 225-228
- L.S.Stephenson, M.C.Latham, and E.A.Ottesen, "Malnutrition and parasitic helminth infections," *Parasitology*, vol.121, pp. S23-S38, 2000.
- R.J.Stoltzfus, H.M.Chway, A.Montresoretal., "Lowdosedaily iron supplementation improves iron status and appetite but not Anemia, whereas quarterly anthelmintic treatment improves growth, appetite and anemia in zanzibari preschool children," *JournalofNutrition*, vol.134, no.2, pp.348-356, 2004.
- L.J.Drake, M.C.H.Jukes, R.J.Sternberg, and D.A.P.Bundy, "Geohelminth infections (ascariasis, trichuriasis, and hookworm): cognitive and developmental impacts," *Seminars in Pediatric Infectious Diseases*, vol.11, no.4, pp.245-251, 2000.
- H. Guyatt, Do intestinal nematodes affect productivity in adulthood? *Parasitology Today*, vol.16, no.4, pp.153-158, 2000.
- Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC, editors. (1997) *Parasitology*, Chapter 20. In: *Color Atlas and Textbook of Diagnostic Microbiology*. 5th edn. New York: JB Lipincott., pp. 1071-1076.
- WHO. *Basic laboratory methods in medical parasitology*. Geneva: WHO; 1991
- Dickson R, Awasthi S, Demellweek C, Williamson P. Anthelmintic drugs for treating worms in children: effects on growth and cognitive performance. *Cochrane Database Syst Rev* 2003; CD000371.
- Wani SA, Ahmed F, zargar S.A, Ahmad z, Ahmad P& Tak, H. Prevalence of intestinal parasites and associated risk factors among school children. In *Srinagar city, Kashmir, India J Parasitol* 2007;93:1541-3.
- Singh R., Singla P., Sharma M., Aparna, and Chaudhary U.. Prevalence of Intestinal Parasitic Infections in a Tertiary Care Hospital in Northern India: Five year retrospective study. *Int.J.Curr.Microbiol.App.Sci* (2013) 2(10): 112-117
- Morathi Y, and Singh B.Prevalence of intestinal parasites at Ujjain, Madhya Pradesh, India: Five year study. *African J. Microb. Research*.September 2011, Vol.5(18)pp.2711-2714.
- Deorukhkar S., et al, The Prevalence Of Intestinal Parasitic Infections In HIV Infected Patients, *Journal of Clinical and Diagnostic Research*. 2011 April, Vol-5(2):210-212
- Manochitra K., Padukone S., Philips S.A. and Parija S.C., Prevalence of Intestinal Parasites among Patients attending a Tertiary Care Centre in South India, *International Journal of Current Microbiology and Applied Sciences* ISSN: 2319-7706 Volume 5 Number 9 (2016) pp. 190-197.
- Arani, A.S.; Alaghebandan, R.; Akhlaghi,L.; Shahi, M. & Lari, A.R. - Prevalence of intestinal parasites in a population in South Tehran, Iran. *Rev. Inst. Med. trop. S. Paulo*, 50(3): 145-149, 2008
- Parameshwarappa, KD., Chandrakanth, C., and Sunil, B.2012. The prevalence of intestinal parasitic infestations and the evaluation of different concentration techniques of the stool examination. *J. Clin. Diag. Res.* 6:1188-1191.
- Bhandari, B., Gupta, G.P. & Mandowara, S.L. *Indian J Pediatr* (1985) 52: 299. doi:10.1007/BF02754864
- Mohammad, KAE., Mohammad, AAE., El-nour, MFA., Saad, MY., and Timsah, AG.2012. The prevalence and associated risk factors of intestinal parasitic infections among school children living in rural and urban communities in Damietta Governorate, Egypt. *Academia Arena.* 4(5):90-97.
- Chandrasekhar MR, Nagesha CN .Intestinal helminthic infestation in children. *Ind.J. Pathol.Microbiol.*2003.46:492-494
- Gatei, W., Wamae, C., Mbae, C., Waruru, A., Mulinge, E., Waithera,T., Gatika, S., Kamwati, S., Revathi, G., and Hart, C. (2006). Cryptosporidiosis; prevalence, genotype analysis and symptoms associated with infection in Kenya, *American Journal of Tropical medicine and Hygiene.* 75: 78 – 82
- Chunge, R. N., Simwa, J. K., Karumba, P. N., Kenya, P. R., Kinoti, S. N., Mutunga, J. and Nagekerke, N. (1992). Comparative aetiology of childhood diarrhoea in Kakamega and Kiambu districts, Kenya. *East Africa medical Journal.*69: 437 – 441.
- Mathan M.M., Venkatesan S., George R., Mathew M. & Mathai V. (1985). – *Cryptosporidium* and diarrhoea in southern Indian children. *Lancet*, 2, 1172-1175.
- Saraswati K., Pandit P.V., Deodhar L.P. & Bichile L.S. (1998). – Prevalence of cryptosporidiosis in Bombay. *Indian J. med. Res.*, 87, 221-224.
- Das P., Sengupta K., Dutta P., Bhattacharya M.K., Pal S.C. & Bhattacharya S.K. (1993). – Significance of *Cryptosporidium* as an etiological agent in acute diarrhea in Calcutta: a hospital based study. *J. trop. Med. Hyg.*, 96, 124-127.
- Ajjampur, S. S., B. P. Gladstone, D. Selvapandian, J. P. Muliylil, H. Ward, and G. Kang. 2007. Molecular and spatial epidemiology of cryptosporidiosis in children in a semiurban community in South India. *J. Clin. Microbiol.* 45:915-920.
- Kaur, R., D. Rawat, M. Kakkar, B. Uppal, and V. K. Sharma. 2002. Intestinal parasites in children with diarrhea in Delhi, India. *Southeast Asian J. Trop. Med. Public Health* 33:725-729.

How to cite this article: Mathuria YP, Singh A. Prevalence of Intestinal parasites at a Tertiary Care Centre at the Foothills of Himalayas, Srinagar, Uttarakhand, India: A six-year Observational Study. *Ann. Int. Med. Den. Res.* 2019; 5(4): MB14-MB18.

Source of Support: Nil, **Conflict of Interest:** None declared