

Original Research Article

Prevalence of *Cryptosporidium* in immunocompetent patients at a tertiary care centre at Moradabad, Western Uttar Pradesh, India: A One-year observational study

Yogendra Pratap Mathuria*¹, Archana Singh²¹ Associate professor, Department of Microbiology, Government Doon Medical College, Dehradun.² Assistant Professor, Department of Surgery, Uttarakhand Ayurvedic University, Harrawala, Dehradun.

*Corresponding author

Yogendra Pratap Mathuria

Email: ypm.1702@yahoo.com

Abstract: Cryptosporidiosis 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 in children and among high-risk groups. The aim of the study was to find out the prevalence of *Cryptosporidium* infections in Moradabad district in immunocompetent patients in Western Uttar Pradesh and compare and correlate it with gender, age group, area (rural or urban) and main complains. Stool samples from 643 immunocompetent patients were collected and 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 and ELISA for *Cryptosporidium* antigens were done. Out of total 643 patients, 178 (27.68%) had *Cryptosporidium* infection. Maximum numbers of patients were in the age group of 0-10yrs (277,43.08%) whereas out of these, 77 patients were found positive(27.8%), followed by 11-20 yrs age group(153,23.79%), and out of these, 53 (34.64%) were found positive, thus total positive patients of or less than twenty years of age were130,(73.03% of all positive patients).Out of total 643 patients, 383 (59.57%) were male and 260 (40.43%) were female patients and out of total 178 positive patients,105 (58.98%) were male patients. Most of the positive patients were from rural area, 108(60.67%). Diarrhoea(off and on) was the main complain in 163(91.57%) patients, followed by abdominal cramps in158(88.76%), anorexia and nausea in 101(56.74%) and Fever in 72 (40.44%) patients. Prevalence of *Cryptosporidium* infectionis high(27.68%)in Moradabad district in Western Uttar Pradesh.

Keywords: *Cryptosporidium*, Modified acid fast staining, Macroscopic, ELISA

INTRODUCTION

Cryptosporidiosis is the infection in humans and animals with different *Cryptosporidium* species, which is obligate intracellular coccidian parasite. These were first discovered by American parasitologist Tyzzer in mice in 1912 and first linked with disease in man in 1976. A single species was first thought to cause disease in man but molecular diagnostic tools have enabled several different species to be identified[1]. *Cryptosporidium hominis* is found only in humans and this, together with *Cryptosporidium parvum* (which also infects cattle), are amongst the most common species found in man[2].

It has emerged as an important cause of diarrhoeal illness worldwide, particularly in young

children and immunocompromised patients. The clinical problems associated with *Cryptosporidium* infection are being recognised more widely and the parasite was included in the World Health Organization's 2004 list of diseases that "exhibit a considerable and increasing global burden and impair the ability of those infected to achieve their full potential, both developmentally and socio-economically"[3].

Intestinal *Cryptosporidium* infection 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 in children and among high-risk groups [4]. The frequency and incidence of Intestinal parasites also varies with age,

sex and geography[5]. 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[6]. In India, prevalence of Cryptosporidiosis reported by different workers shows wide variations from 1.13% to 30.03% [7,8,9]. In the Global Enteric Multicenter Study (GEMS) conducted in multiple sites in Sub-Saharan Africa and South Asia, *Cryptosporidium* species was found to be second to only rotavirus as the leading cause for moderate to severe diarrhoea in children under five[10,11].

Most of the human infections are caused by two species of *Cryptosporidium*, namely *Cryptosporidium hominis* and *Cryptosporidium parvum* [12,13]. wever, six other species of this protozoa (*Cryptosporidium meleagridis*, *Cryptosporidium felis*, *Cryptosporidium canis*, *Cryptosporidium suis*, *Cryptosporidium muris* and *Cryptosporidium andersoni*), which commonly infect specific species of animals, may occasionally spread to human beings[14,19]. Intestinal cryptosporidiosis hardly ever cause death but have high morbidity, thus chronic and subtle effects on health and nutritional status of the host[10,20], they also damage physical and mental development of children, prevent educational achievement, and hamper economic development [21,22]

This study was conducted at Teerthanker Mahaveer Medical College & Research Institute (TMMC&RI), situated at the out skirts of Moradabad city in Moradabad District(located at 28° 49' 48" N, 78° 46' 48" E) and which is the only referral centre in Moradabad and adjoining areas. 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 attending a tertiary care teaching hospital at Moradabad, Western Uttar Pradesh.

MATERIAL AND METHODS

This hospital based study of one year period (July 2009 – June 2010) was carried out in Parasitology section of department of Microbiology, TMMC&RI, situated at the outskirts of Moradabad city in Moradabad district, Western Uttar Pradesh(UP).

A total of 643clinically suspected, randomly selected cases of intestinal parasitic infections of all age groups and both sexes coming to out – patient departments of TMMC&RI were studied. History was taken in relation to name, age, address and area (rural-urban). Patients under antihelminthic, on going immune-suppressive treatment, haematological malignancy and positive serological test for Human immunodeficiency virus (HIV) infection 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 consistency, colour, odour, blood & mucous and presence adult worms or their body segments also, and further microscopic examination of stool wet mounts(both saline and iodine mounts),Modified Acid fast staining and ELISA (Antigen detection Microwell ELISA, research, Inc. Carlsbad) were done.

OBSERVATIONS AND RESULTS

A total of 643immunocompetent patients of clinically suspected of intestinal parasitic infections were included in the study and examined for *Cryptosporidium species*. Maximum numbers of patients (277, 43.08%) were from 0-10yrs age group, followed by 153 (23.79%) patients were from 11-20yrs age group and minimum numbers of patients were from more than 60 yrs age group.[Figure 1]

Among the total patients(643), male patients,383(59.57%) were more common than the females, 260 (40.43%).[Figure1]

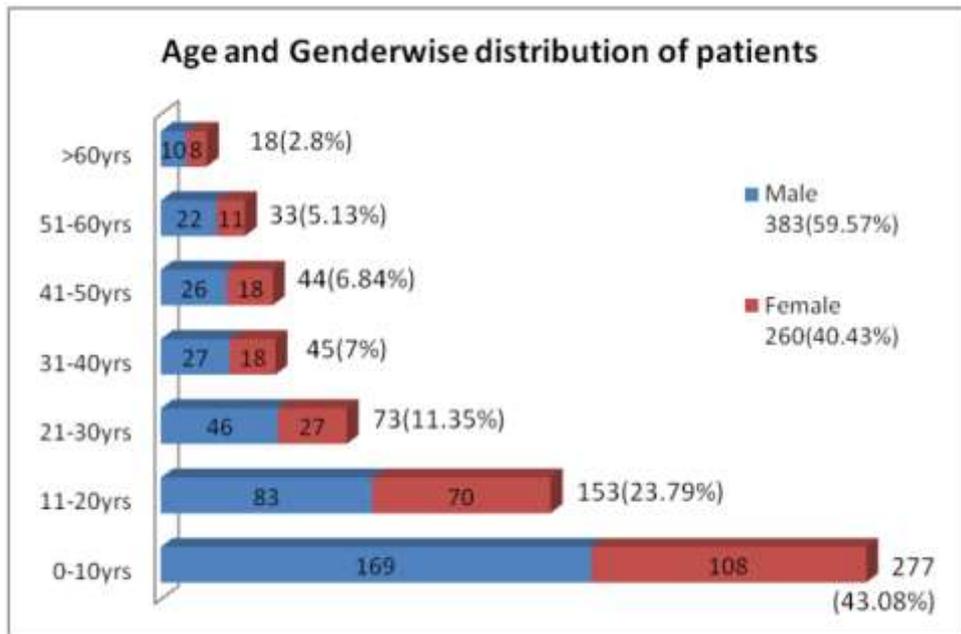


Fig-1: Relationship between Age and Gender of patients

Total 178(27.68%) patients were found positive for Cryptosporidium out of total 643 patients. Maximum number of Cryptosporidium isolates were in the age group of 0-10yrs (77, 43.53%), followed by 11-20yrs age group (53, 29.77%). Thus 73.30% of all

Cryptosporidium isolates were in the age group of 0-20years.

Out of total 178 positive patients, 105(58.98%) were males, while 73(41.02%) were females.

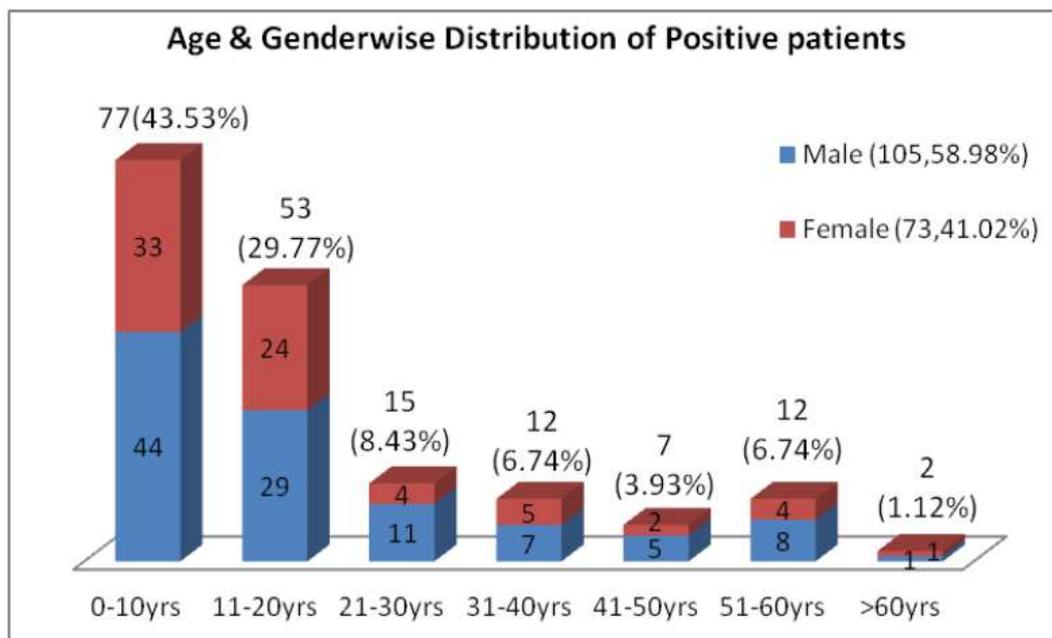


Fig- 2: Relationship between Age, Gender and Positive patients.

In this study, most of the positive patients were from rural areas, (108, 60.67%). The ratio of positive

patients from Urban to Rural area was 1.5.[Figure 3]

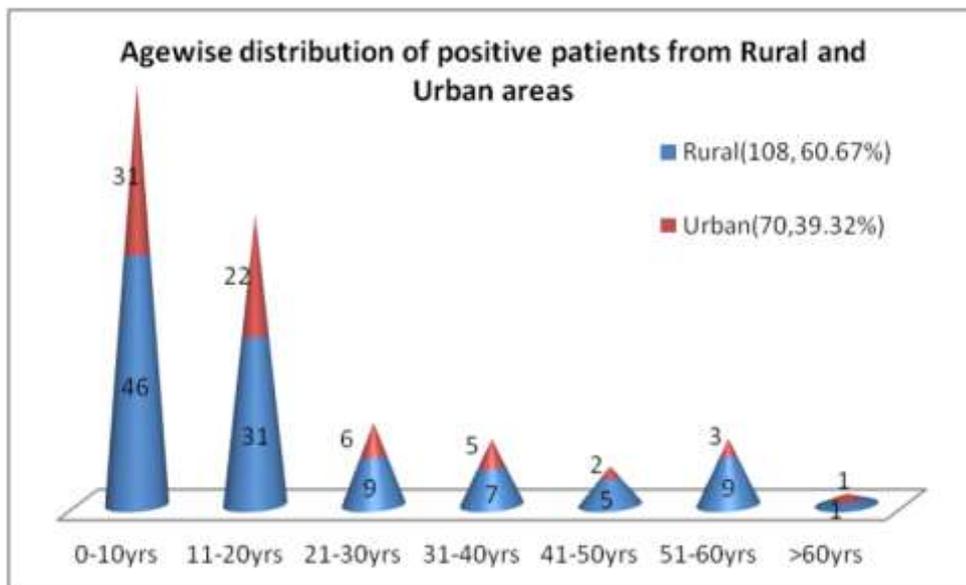


Fig-3: Age-wise distribution of positive patients from Rural and Urban areas

Most common complain of cryptosporidiosis patients in this study was Diarrhoea(off and on) in 163(91.57%) patients, followed by abdominal cramps

in 158(88.76%) of patients, anorexia and nausea in 101(56.74%) and fever in 72 (40.44%) patients.[Figure 4].

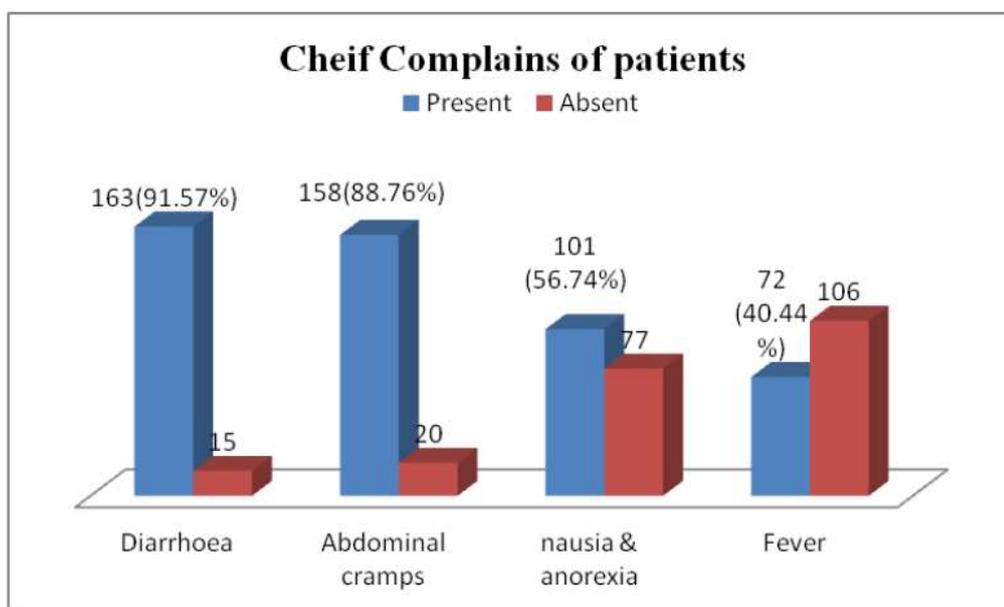


Fig-4:Chief complains of patients

DISCUSSION

Stool examination for parasitic ova, cysts, trophozoite and larvae remains the gold standard for laboratory diagnosis for intestinal Parasitic infections(IPIs)[24] 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[25]. One hundred and seventy eight(178)cases were found positive for *Cryptosporidium* out of suspected 643 cases of intestinal parasitic infections, thus the prevalence rate in this study was 27.68%, which is high in

immunocompetent patients. Various studies from rural and urban regions have shown different prevalence rates ranging from 2% to 94.4% in HIV positive patients[26,27,28]. and the prevalence of cryptosporidialdiarrhea in hospitalized children ranged from 1.13% to 30.07%[7,8,9] and in 10% of immunocompetent patients[29].

In this study, it was observed that Cryptosporidiosis is more common in male patients than the females(Male : Female ratio:1.5:1) [Figure 2] which is in concordance with study at Lucknow[29]. 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 86 years. Maximum positive cases were in the age group of 0– 20 years (73.03% of total positive cases)[Figure 2],Cryptosporidiosis was more often found in younger patients than older. It is well-known that children suffer from cryptosporidiosis more commonly than adults. This has been proved in earlier studies as well [29,30,31,32].

Prevalence rate was higher in rural population which is in concordance other studies from Maharashtra[9] and Lucknow[29]. This could be due to low socio-economic conditions, improper drinking water supplies and low literacy rates prevailing in rural areas.

Chief complains of the patients were Diarrhoea (on and off) in 91.57% patients, followed by abdominal cramps in 88.76% which is in concordance to study in Lucknow[29].

CONCLUSION

Prevalence of cryptosporidium infection is 27.68%in Moradabad district in Western Uttar Pradesh which is quite high, which could be because of it being the industrial city, low literacy rate, improper drinking water supply, low socio-economic status and poor sanitation in the rural areas.

It is of immense importance to accurately diagnose the Cryptosporidiosis case as treatment differs for different causative agents.

Further research on pattern of zoonotic parasites found in 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

1. Rzezutka A ,Kaupke A; Occurrence and molecular identification of Cryptosporidium species isolated from cattle in Poland. Vet Parasitol. 2013 Mar 19. pii: S0304-4017(13)00154-4. doi: 10.1016/j.vetpar.2013.03.009.
2. Mary C, Chapey E, Dutoit E, et al; Multicentric evaluation of a new real-time PCR assay for quantification of Cryptosporidium sp and identification of Cryptosporidium parvum and hominis. J Clin Microbiol. 2013 May 29.
3. Diagnostic tests for Cryptosporidium; Public Health Wales
4. 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.
5. Ahsan-ul-Wadood, Bari A, Rhman A, Qasim KF. Frequency of Intestinal Parasite Infestation in Children Hospital Quetta. Pakistan J Med Res 2005;44 (2):87-8
6. WHO.2008. The global burden of disease: 2004 updates, Geneva: World Health Organization
7. Iyer RN, Rao JR, Venkatalakshmi A, Nahdi FB. Clinical and microbiology profile and outcome of diarrhea by coccidian parasites in immunocompetent children. Pediatr Infect Dis J 2015; 34:937-9.
8. Bera P, Das S, Saha R, Ramachandran VG, Shah D. *Cryptosporidium* in children with diarrhea: A hospital-based Study. Indian Pediatr 2014; 51:906-8.
9. Gupta AK. Intestinal coccidian parasitic infections in rural community in and around Loni, Maharashtra. J Parasit Dis 2011; 35:54-6.
10. Kotloff KL, Nataro JP, Blackwelder WC, Nasrin D, Farag TH, Panchalingam S, et al. Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): A prospective, case-control study. Lancet 2013;382:209-22.
11. Sow SO, Muhsen K, Nasrin D, Blackwelder WC, Wu Y, Farag TH, et al. The burden of *Cryptosporidium* diarrheal disease among children <24 months of age in moderate/high mortality regions of Sub-Saharan Africa and South Asia, utilizing data from the Global Enteric Multicenter

- Study (GEMS). PLoSNegl Trop Dis 2016;10:e0004729.
12. Mohandas, Sehgal R, Sud A, Malla N. Prevalence of intestinal parasitic pathogens in HIV-seropositive individuals in Northern India. *Jpn J Infect Dis* 2002;55:83-4.
 13. Lanjewar DN, Rodrigues C, Saple DG, Hira SK, DuPont HL. *Cryptosporidium*, isospora and strongyloides in AIDS. *Natl Med J India* 1996;9:17-9
 14. Dwivedi KK, Prasad G, Saini S, Mahajan S, Lal S, Baveja UK. Enteric opportunistic parasites among HIV infected individuals: Associated risk factors and immune status. *Jpn J Infect Dis* 2007;60:76-81
 15. Becker ML, Cohen CR, Cheang M, Washington RG, Blanchard JF, Moses S. Diarrheal disease among HIV-infected adults in Karnataka, India: Evaluation of risk factors and etiology. *Am J Trop Med Hyg* 2007;76:718-22.
 16. Giri TK, Pande I, Mishra NM, Kailash S, Uppal SS, Kumar A. Spectrum of clinical and laboratory characteristics of HIV infection in northern India. *J Commun Dis* 1995;27:131-41.
 17. Anand L, Brajachand NG, Dhanachand CH. Cryptosporidiosis in HIV infection. *J Commun Dis* 1996;28:241-4.
 18. Sharma S, Sachdeva P, Viridi JS. Emerging water-borne pathogens. *ApplMicrobiolBiotechnol* 2003;61:424-8.
 19. Vignesh R, Balakrishnan P, Shankar EM, Murugavel KG, Hanas S, Cecelia AJ, *et al.* High proportion of isosporiasis among HIV-infected patients with diarrhea in southern India. *Am J Trop Med Hyg* 2007;77:823-4.
 20. Kotloff KL, Nataro JP, Blackwelder WC, Nasrin D, Farag TH, Panchalingam S, *et al.* Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): A prospective, case-control study. *Lancet* 2013;382:209-22.
 21. Bhattacharya MK, Teka T, Faruque AS, Fuchs GJ. *Cryptosporidium* infection in children in urban Bangladesh. *J Trop Pediatr* 1997;43:282-6.
 22. Guerrant RL, DeBoer MD, Moore SR, Scharf RJ, Lima AA. The impoverished gut – a triple burden of diarrhoea, stunting and chronic disease. *Nat Rev GastroenterolHepatol* 2013;10:220-9.
 23. Moore SR, Lima NL, Soares AM, Oriá RB, Pinkerton RC, Barrett LJ, *et al.* Prolonged episodes of acute diarrhea reduce growth and increase risk of persistent diarrhea in children. *Gastroenterology* 2010;139:1156-64.
 24. WHO. Basic laboratory methods in medical parasitology. Geneva: WHO; 1991
 25. 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.
 26. Mehta KD, Vacchani A, Mistry MM, Kavathia GU, Goswami YS. To Study the Prevalence of Various Enteric Parasitic Infections Among HIV Infected Individuals in the P.D.U. Medical College and Hospital, Rajkot, Gujarat, India. *J ClinDiagn Res.* 2013;7:58-60
 27. Janagond AB, Sasikala G, Agatha D, Ravinder T, Thenmozhivalli PR. Enteric Parasitic Infections in Relation to Diarrhoea in HIV Infected Individuals with CD4 T Cell Counts <1000 Cells/mul in Chennai, India. *J ClinDiagn Res.* 2013;7:2160-2.
 28. Anand L, Dhanachand C, Brajachand N. Prevalence and epidemiologic characteristics of opportunistic and nonopportunistic intestinal parasitic infections in HIV positive patients in Manipur. *J Commun Dis.* 1998; 30:19-22.
 29. Ghoshal U, Dey A, Ranjan P, Khanduja S, Agarwal V, Ghoshal U C. Identification of opportunistic enteric parasites among immunocompetent patients with diarrhoea from Northern India and genetic characterisation of *Cryptosporidium* and *Microsporidia*. *Indian J Med Microbiol* 2016;34:60-6
 30. Dhanabal J, Selvadoss PP, Muthuswamy K. Comparative study of the prevalence of intestinal parasites in low socioeconomic areas from South Chennai, India. *J Parasitol Res* 2014;2014:630968.
 31. Yoder JS, Wallace RM, Collier SA, Beach MJ, Hlavsa MC, Centers for Disease Control and Prevention (CDC). Cryptosporidiosis surveillance – United States, 2009-2010. *MMWR SurveillSumm* 2012;61:1-12.
 32. Yadav NP, Sah DK, Manadhar S, Singh JK. *Cryptosporidium* infection in school children in Dhanusha district, Nepal. *Janaki Med Coll J Med Sci* 2013;1:40-5.