Study of prevalence of parasitic intestinal infections in a tertiary care center in Central India serving a rural population: a retrospective analysis

Priyanka P. Chaubey, Suvarna V. Sande, Ashwini A. Mankar

Department of Microbiology, Datta Meghe Medical College, Nagpur, Maharashtra, India

Correspondence to Priyanka P. Chaubey, MBBS, MD, 703/C, Utkarsh Anuradha Apartments, Civil Lines, Nagpur 440001, Maharashtra, India. Mobile: 919096369922; e-mail: chaubeypriyanka35@gmail.com

Received: 18 October 2022
Revised: 19 December 2022
Accepted: 24 December 2022
Published: 2 June 2023

Egyptian Pharmaceutical Journal 2023, 22:223–228

Backgrouud
Intestinal parasitic infections is a globally prevalent condition with variable morbidities like bleeding, iron-deficiency anemia, megaloblastic anemia, intestinal obstruction, fat malabsorption, hepatosplenomegaly, and mortality. It is also responsible for retardation in growth and poor mental development in growing children, which is the worst attacked age group. Its prevalence varies from geographical regions like tropical and subtropical and also varies from populations like in urban, suburban, and rural. Periodic monitoring of prevalence to set control programs for that locality is needed.

Aim
To study the prevalence of various parasitic intestinal infections in a rural population in Central India.

Materials and methods
This descriptive and retrospective study was done in a 350-bed tertiary care hospital located in Central India serving a rural population. We have extensively studied all stool samples collected and reported between August 2019 and May 2022.

Results
A total of 1120 stool samples were reported during our study period, of which 518 were of females and 602 were of males. Of these 1120 stool samples, 91 samples showed the presence of parasite. The overall prevalence of intestinal parasitic infection in our study population is 8.13%, whereas the prevalence of the same in males and females is 8.63 and 7.53%, respectively.

Conclusion
We have found no association or effect of sex on intestinal parasitic infections in our study population. The prevalence of the same was lower in our rural population compared with various other studies, indicating good hygiene level in the society. The prevalence was highest in 21–40-year age group. Age group had a significant association with intestinal parasitic infections in our study population.

Keywords:
helminth, intestinal parasitic infections, prevalence, protozoa, stool

Egypt Pharmaceut J 22:223–228

1687-4315

Introduction

Intestinal parasitic infections are seen throughout the world as one of the common infections in humans. Intestinal parasite infections are very common in India, a tropical developing nation in South East Asia with poor communities, and they are one of the most common medical and public health issue [1,2]. As per the WHO, more than one billion humans (almost 15–20%) are chronically parasitized globally. The prevalence of parasitic infections has decreased over the period of time in last 70 years [2,3].

Indian scenario shows the range of prevalence from 4.96 to 90.6%. The prevalence in Western India is 15.6% in urban slum population [4]. There are few studies that depict the prevalence of intestinal parasitic infection in the urban slum of Central India [5], but we did not find similar studies in rural areas of Central India. Therefore, here, in this study, we retrospectively observed all stool sample reports that were received between August 2019 and May 2022.

Aims

The aim was to study the prevalence of various parasitic intestinal infections in a rural population of Central India.

Objectives

The objective of this study was to establish the prevalence along with its demographic pattern of

intestinal parasitic infections in a rural area of Central India and to study the pattern of various pathogenic parasitic types involved in infection.

Materials and methods

We performed a descriptive and retrospective study after approval from the institutional ethics committee (DMMC(DU)/IEC/2022/22) of the microbiology section of the central clinical laboratory of a 350-bed tertiary care hospital located in central India using laboratory records and reports. The study was done to ascertain the prevalence of intestinal parasite infections among the suspected patients. The parasite dispersion was also assessed according to the patients' sex and age. The association between age and sex variables with outcome intestinal parasitic infection was assessed using χ^2 test, and P value of less than 0.05 was considered significant. The data from August 2019 to May 2022 were reviewed retrospectively in our tertiary care center, which serves a rural population in Central India. The data included stool samples from outpatient and hospitalized patients suspected of intestinal parasitic infection. Data included 1120 stool samples that were received in microbiology laboratory in labeled, screw-capped, plastic, wide-mouth containers and freshly collected during the aforementioned period as per laboratory's sample acceptance and rejection criteria of stool examination. As per the standard operating procedures of laboratory, the stool samples were examined macroscopically (by naked eye inspection for color, presence of visible blood, consistency, nature of feces, Taenia proglottids, and adult worm presence and the odor) and microscopically (using normal saline and Lugol's iodine for protozoa cysts and trophozoites and ova of helminth). The findings were written in laboratory record in tabulated form. As per standard operating procedure, within 1 h of specimen collection, it was processed, and repeat samples were collected for specimens that were rejected and for specimens that had delayed processing. Morphological characteristics were used to identify protozoa and helminth [6].

We have retrospectively and extensively studied all these laboratory records and reports.

Results

Of 1120 stool samples, 518 were of females and 602 were of males. Of these 1120 stool samples, 91 samples had positive findings on microscopy. Of these 91 positive stool samples, 39 belonged to females and 52 belonged to male patients, with gastrointestinal presentation as depicted in Fig. 1.

The distribution of prevalence as per age is given in Fig. 2, which shows the highest prevalence in 21–30-year age group.

Age-wise and sex-wise distribution of prevalence of these infections is given in Fig. 3, where the prevalence of disease in the male population was 8.63% and that in female population was 7.53%. The highest prevalence among male was seen in 21–30-year age group and in female population is seen in 31–40-year age group.

The total number of patients infected with intestinal parasites was found as 91, but two of these patients had dual infection of *Ascaris lumbricoides* and *Ancylostoma deodenale*. Organism-wise distribution of all stool samples positive for parasitic infections is shown in Fig. 4.

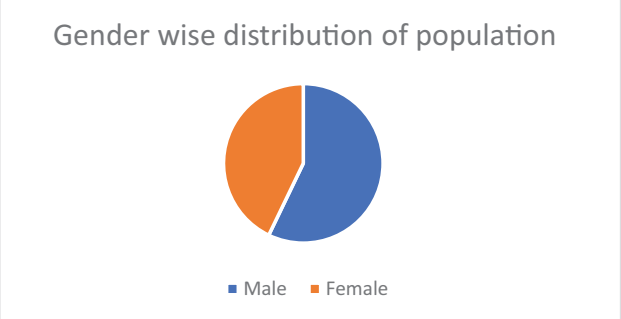
On assessing the infection pattern of different parasitic infections, we found very few double or mixed infections, as seen is two patients. The prevalence of single infection was seen is 7.95% (n=89) and that of double infection was 0.18% (n=2).

We have studied association of available variables like age group and sex with intestinal parasitic infections by χ^2 test among the population as given in Table 1. The association between sex difference and intestinal parasitic infection was found to be insignificant, whereas we found a significant association of age group with intestinal parasitic infections.

Discussion

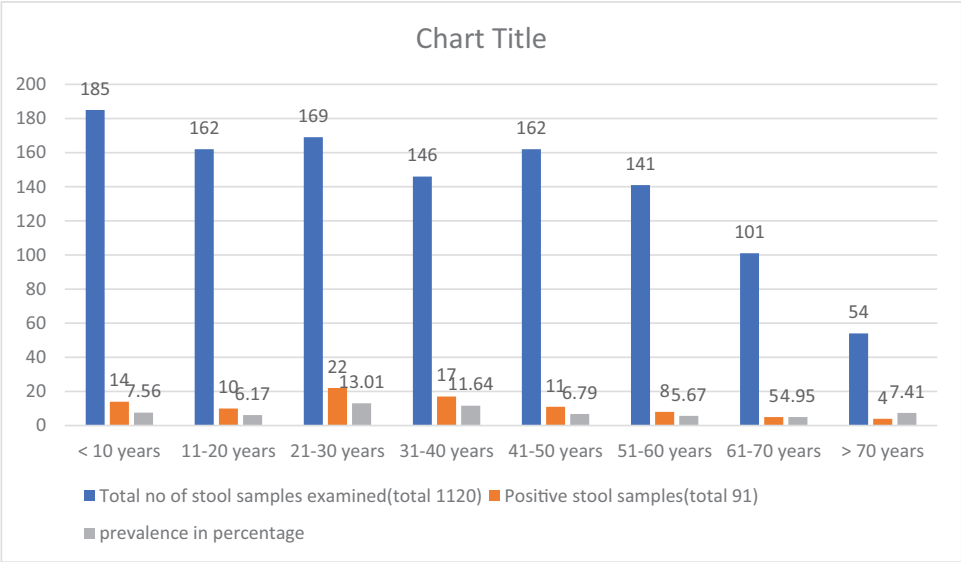
In this study, 1120 samples of stool were tested, and 91 (8.13%) of those samples contained at least one parasite. The prevalence was discovered to be

Figure 1



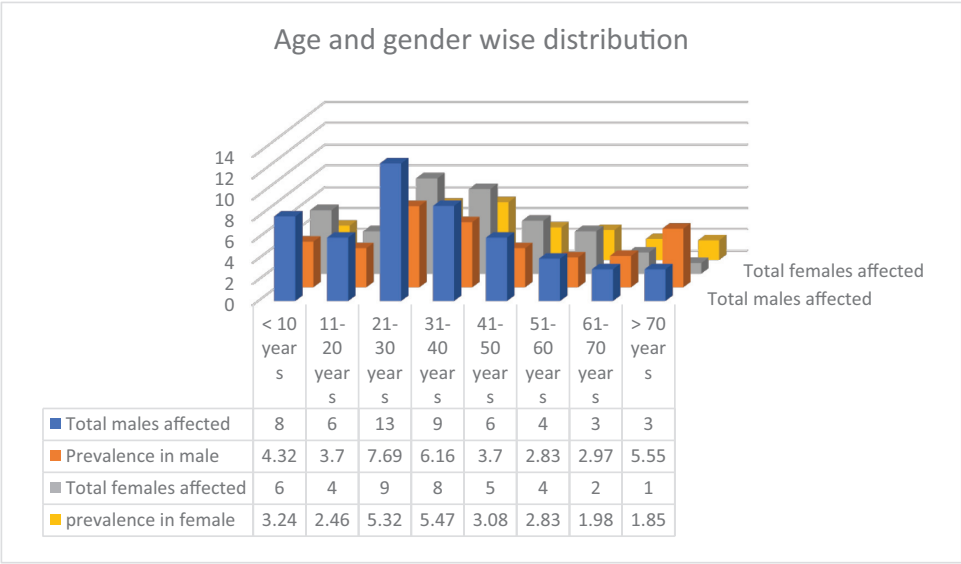
Sex-wise distribution of total positive intestinal parasitic infections.

Figure 2



Age-wise distribution of prevalence of intestinal parasitic infections.

Figure 3



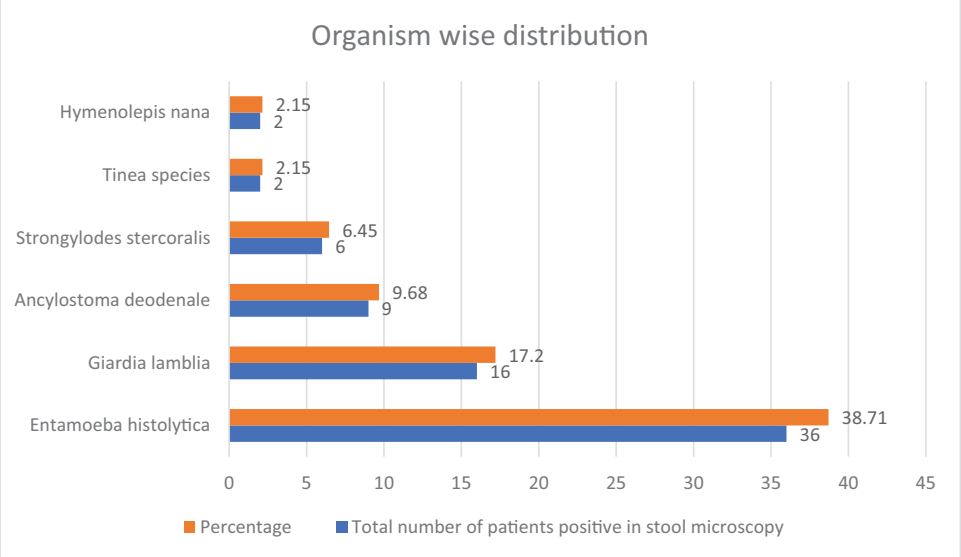
	< 10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	> 70 years
Total males affected	8	6	13	9	6	4	3	3
Prevalence in male	4.32	3.7	7.69	6.16	3.7	2.83	2.97	5.55
Total females affected	6	4	9	8	5	4	2	1
prevalence in female	3.24	2.46	5.32	5.47	3.08	2.83	1.98	1.85

Age-wise and sex-wise distribution of prevalence.

Table 1 Association of sex and age groups with intestinal parasitic infections

	Population infected with intestinal parasitic infections				
Variables	Yes	No	χ^2 value	*P* value	Significance
Sex					
Male	52	550	0.4587	0.498	No
Female	39	479			
Age group					
<20	24	323	10.8343	0.012656	Yes
21–40	39	276			
41–60	19	284			
>60	9	146			

Figure 4



Organism-wise distribution of all stool samples positive for parasitic infections.

Table 2 Comparative data of the prevalence of intestinal parasitic infections in India

References	Prevalence (%)
Present study	8.13
Singh *et al.* [10]	4.91
Patel *et al.* [11]	5.56
Davane *et al.* [8]	6.63
Singh *et al.* [12]	6.68
Jain *et al.* [7]	7.2
Kumar *et al.* [13]	10.7
Ramesh *et al.* [14]	12.5
Singh *et al.* [5]	13.9
Marothi and Singh [15]	21.4
Patel *et al.* [16]	34
Rao *et al.* [17]	59.5
Chandrasedhar and Nagesha [18]	68
Hegde and Patel [9]	90.6

concordant with the results of Jain *et al.* [7] (7.2%) and Davane *et al.* [8] (6.63%). Numerous studies demonstrate a higher prevalence of intestinal parasite infections, with Hegde and Patel [9] demonstrating that it is above 90% as indicated in Table 2. There is wide difference between prevalence from different parts of India, which may be caused by variations in the times, locations, and examination techniques utilized.

The prevalence of intestinal parasitic infections was found to be highest in 21–30-year age group in the present study, whereas many study have reported a maximum prevalence in less than 10- and 11–20-year age groups [7,8,11,13,15]. Few authors [5,16] showed that the highest prevalence was in 21–30-year age group, like in the present study. Marothi and Singh [15] showed the second highest prevalence in 21–30-year age group.

In our study, the prevalence among males (8.63%) was slightly more compared with females (7.53). Most of the authors like Singh *et al.* [5], Jain *et al.* [7], Patel *et al.* [16] and Singh *et al.* [10] depicted male preponderance in affected population, whereas Marothi and Singh [15] showed a higher prevalence among females (27.4%) as compared with males (18.2). Therefore, we calculated the association of prevalence of intestinal parasitic infections with sex with the help of χ^2 test, but it came out to be insignificant for our study population.

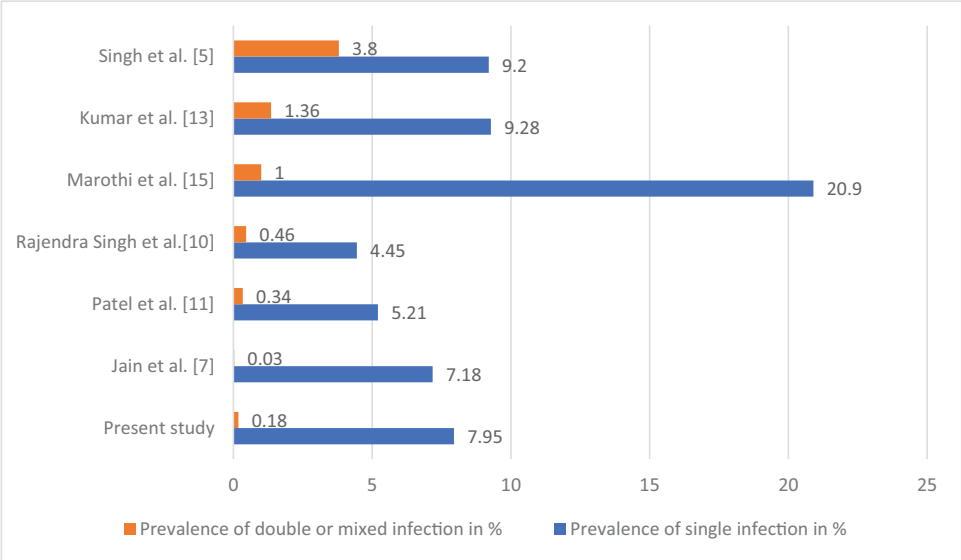
When comparing organism-wise prevalence of various parasitic infections in this study, we found a higher positivity of protozoal infections (55.91%) compared with helminthic infections (44.09%). Similar findings were observed in various other studies [5,15]. Few authors [11] found higher helminthic infections (69.23%) compared with protozoal infections, as shown in Table 3. The most common parasite responsible for intestinal infections in this study reflecting a rural population of Central India was *Entamoeba histolytica*, which was concordant with the findings for many other authors [5,7,15].

The prevalence of double infection in our study was 0.18%, which is concordant with the findings of Jain *et al.* [7] (0.03%) and Patel *et al.* [11] (0.34%), but lower

Table 3 Comparative data of common parasitic infections and percentage positivity of protozoal infections

References	First most common parasitic infection (% out of total)	Second most common parasitic infection (% out of total)	Third most common parasitic infection (% out of total)	Protozoal infections of total infections in %
Present study	*Entamoeba histolytica* (38.71)	*Ascaris lumbricoides* (23.66)	*Giardia lamblia* (17.20)	55.91
Marothi and Singh [15]	*Entamoeba histolytica* (53.4)	*Giardia lamblia* (13.1)	*Ascaris lumbricoides* (13.48)	67.73
Singh *et al.* [5]	*Entamoeba histolytica* (42.43)	*Giardia lamblia* (23.6)	*Hymenolepis nana* (1.39)	96.5
Jain *et al.* [7]	*Entamoeba histolytica* (39.3)	*Giardia lamblia* (35.7)	*Ancylostoma duodenale* (8.7)	75.4
Singh *et al.* [12]	*Giardia lamblia* (58.5)	*Entamoeba histolytica* (32)	*Ascaris lumbricoides* (5.8)	90.5
Patel *et al.* [11]	*Giardia lamblia* (28.99)	Hymenolepis nana (20.29)	*Ancylostoma duodenale* (14.49)	34.79
Patel *et al.* [16]	*Entamoeba histolytica* (57.35)	*Giardia lamblia* (39.71)	*Hymenolepis nana* (1.47)	98.5
Davane *et al.* [8]	*Ascaris lumbricoides* (45.4)	*Hymenolepis nana* (36.3)	*Ancylostoma duodenale* (27.2)	21

Figure 5



Comparison of various studies for the prevalence of single and double parasitic infections.

when compared with Marothi and Singh [15] (1%) and Singh *et al.* [5] (3.8%). The comparative prevalence of single and double or mixed infections is explained in Fig. 5.

Conclusion

This study brings us to the conclusion that intestinal parasitic infection in our study population had an overall prevalence of 8.13%, whereas the prevalence of the same in male and female was 8.63 and 7.53%, respectively. Therefore, no association or effect of sex was seen on intestinal parasitic infections in the study population of rural Central India as proven by χ^2 test. The prevalence of intestinal parasitic infection was observed to be highest in the 21–40-year age group and lowest in more than 60-year age group. Age group had a significant association with intestinal parasitic infections in our study population as proven by χ^2 test. This age group is more exposed to the risk factors of intestinal parasitic infections like traveling, frequent gatherings, occupation, residing in hostel, and eating contaminated food outside. We can also interpret that the hygiene level in our rural community of central India is good. Our study has given a glance of the prevalence of intestinal parasitic infections in a rural population of Central India; but we believe that a detailed prospective study is needed with at least three stool samples per patient and usage of stool concentration techniques with clinicopathological correlation to get the actual prevalence in our rural population.

Acknowledgements

Contribution of authors: Dr Priyanka P. Chaubey contributed toward conception, design, acquisition of data, analysis of data, interpretation of data, and drafting of article. Dr Suvarna V. Sande contributed

toward conception, design, and drafting of article. Dr Ashwini A. Mankar contributed toward drafting of article and revision.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Savioli L, Bundy D, Tomkins A. Intestinal parasitic infections: a soluble public health problem. Trans R Soc Trop Med Hyg 1992; 86:353–354.

2 Montresor A, Crompton DWT, Hall A, Bundy DAP, Savioli L. Guidelines for the evaluation of soil transmitted helminthiasis and schistosomiasis at community level. Geneva: World Health Organization; WHO/CTC/SIP/98. World Health Organization. https://apps.who.int/iris/handle/10665/63821

3 Keiser J, Utzinger J. The drugs we have and the drugs we need against major helminth infections. Adv Parasitol 2010; 73:197–230.

4 Misra S, Duttaroy B, Shroff B. The prevalence of intestinal parasitic infections in the urban slums of a city in Western India. J Infect Public Health 2013; 6:142–149.

5 Singh T, Bhatambare GS, Deshmukh AB, Bajpai T, Srivastava I, Patel KB. Study of the prevalence of intestinal parasitic infections in a tertiary care hospital located in central India. Int J Health Syst Disaster Manage 2014; 2:113–116.

6 Karyakarte R, Damle A. Diagnostic methods in parasitology. In: Karyakarte R, Damle A. Medical parasitology. 3rd ed. Kolkata: Books and allied (P) LTD; 2012. 247–265

7 Jain S, Kabi S, Bhoi P, Panigrahy R, Sahu KK. Intestinal parasitic infection: prevalence in recent years in a tertiary care hospital. Int J Cur Res Rev 2021; 13:53–56.

8 Davane MS, Suryawanshi NM, Deshpande KD. Prevalence study of intestinal parasitic infections in a rural hospital. Int J Recent Trends Sci Technol 2012; 2:01–03.

9 Hegde GR, Patel JC. Prevalence of intestinal parasitic infestation in rural area. J Postgrad Med 1986; 32:225.

10 Singh R, Aggarwal RK, Koul N. Prevalence of intestinal parasites at a tertiary care centre at Dehradun, Uttarakhand, India. Int J Curr Microbiol Appl Sci 2019; 8: 932–937.

11 Patel MM, Patel PR, Gamit BG, Modi J, Padsala S. Prevalence of intestinal parasites infestation in Surat City of South Gujarat. A hospital based study. Natl J Comm Med 2014; 5:273–275.

12 Singh R, Singla P, Sharma M, Aparna Chaudhari U. Prevalence of intestinal parasitic infections in a tertiary care hospital in Northern India: five year retrospective study. Int J Curr Microbiol Appl Sci 2013; 2:112–117.

13 Kumar R, Biswas PP, Yasmin T, Sen A, Ganguly U. Prevalence of intestinal parasitic infections in patients attending a tertiary care hospital in eastern bihar. J Evol Med Dent Sci 2014; 3:6740–6746.

14 Ramesh GN, Malla N, Raju GS, Sehgal R, Ganguly NK, Mahajan RC, *et al.* Epidemiological study of parasitic infestations in lower socio-economic group in Chandigarh (North India). Indian J Med Res 1991; 93:47–50.

15 Marothi Y, Singh B. Prevalence of intestinal parasites at Ujjain, Madhya Pradesh, India: five-year study. Afr J Microbiol Res 2011; 5:2711–2714.

16 Patel M, Gupta G, Sharma S. Prevalence of parasitic infection and comparison of different types of concentration techniques. Santosh Univ J Health Sci 2020; 6:31–34.

17 Rao VG, Aggrawal MC, Yadav R, Das SK, Sahare LK, Bondley MK, Minocha RK. Intestinal parasitic infections, anaemia and undernutrition among tribal adolescents of Madhya Pradesh. Indian J Community Med 2003; 27:26–29.

18 Chandrasedhar MR, Nagesha CN. Intestinal helminthic infestation in children. Ind J Pathol Microbiol 2003; 46:492–494.