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ORIGINAL ARTICLE

Prevalence of Certain Human Intestinal Parasitic Infections and Associated Risk Factors in District Bulandshahr

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ABSTRACT
Intestinal parasitic diseases constitute a global health burden causing clinical morbidity in millions of people, many of these women of reproductive age and children in developing countries. The aim of the present study was to determine the prevalence and risk factors of intestinal parasitic infections in rural and urban population of district Bulandshahr. The study population consists of rural and urban population of all age groups and both sexes. Chi square test was applied to study the association between prevalence of intestinal parasites and the demographic factors. Odds ratio (OR) and 95% confidence interval (95%CI) of values were also used. P value < 0.05 was considered as significant. The prevalence of intestinal parasites was significantly higher in rural population (χ^2=9.8603, d.f.=1, p=0.0017), illiterate persons (χ^2=8.8169, d.f.=2, p=0.01217), children (χ^2=10.8982, d.f.=2, p=0.0043) and persons walking bare foot (χ^2=14.2688, d.f.=1, p=0.0002) as compared to urban population, graduated persons, adults and population using shoes and slippers during walking respectively. This study shows that intestinal parasitic infections are prevalent in the study area and require immediate control and preventive measures. Educating the population about the spread of intestinal parasitic infections and promoting good hygiene practices, wearing slippers or shoes while walking along with deworming services will have a substantial impact in the prevention of intestinal parasitic infections.
Key words: *Intestinal parasites, Ascaris lumbricoides, risk factors, Bulandshahr*

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INTRODUCTION

It is well known that intestinal parasitic infections are endemic throughout the world and are considered a major single cause of disease and illness. Poor sanitation, poverty, illiteracy, lack of access to potable water and hot and humid tropical climate are factors associated with intestinal parasitic infection [21]. Intestinal parasitic infections cause hundreds of thousands of avoidable deaths each year and are one of the most common infectious diseases in the world [19]. The frequency and incidence of intestinal parasites also varies with age, sex, and geography [1]. Intestinal parasitic diseases constitute a global health burden causing clinical morbidity in 450 million people, many of these women of reproductive age and children in developing countries [16]. Indeed, intestinal parasitic infections, mostly helminths have been linked with an increased risk for nutritional anaemia, protein-energy malnutrition and growth deficits in children, low pregnancy weight gain and intrauterine growth retardation followed by low birth weight [17-18]. Intestinal helminthic infestations are most common among school age children, and they tend to occur in high intensity in this age group [2, 20]. Like other developing countries, intestinal parasitic infections are a major health problem in India. In previous studies conducted in low-socio economic areas in and around Chandigarh, reported the prevalence of intestinal parasitic diseases ranging from 14.6-19.3% [3, 13]. Recently in one of the studies in children from rural as well as urban areas of the Kashmir valley, India, it has been reported that at least one intestinal helminth was found in 71.2 % of the sampled population. The prevalence of *Ascaris lumbricoides* was highest (68.3%), followed by *Trichuris trichiura* (27.9%), *Enterobius vermicularis* (12.7%) and *Taenia saginata* 101 (4.6%) [25]. An estimated 44 million pregnant women have hookworm infections which can cause chronic loss of blood from the intestines and predisposes the women to developing iron deficiency anemia.[4] Intestinal parasitic

infections cause loss of appetite, anemia and weight loss in patients. Therefore, it is necessary to observe the problem and tackle it in the awareness of public health. The aim of the present study was to determine the prevalence and risk factor of intestinal parasitic infections in rural and urban population of district Bulandshahr to identify the related behavioural habits, socio-demographic and environmental issues.

MATERIAL AND METHODS:

This cross-sectional study was conducted from December 2021 to May 2023 to determine the current status and risk assessment of intestinal parasitic infection in district Bulandshahr, Uttar Pradesh. The study population consists of rural and urban population of all age groups and both sexes. Informed consent was obtained from all participants and parents in case of minor participant. Confidentiality was ensured by keeping participants identity confidential. To execute the study conveniently, clinical symptoms and sign of intestinal parasitic infection like abdomen pain, constipation, diarrhoea, more than two stool passing in a day and offensive stool were considered as primary diagnostic tools to enhance the value of estimation**.** Participants with the above clinical features were considered eligible for the present study and all those eligible patients who were available to provide stool samples were included in the study. Personal visits were made to every participant to collect the baseline data regarding socio-demographic factors using a structured questionnaire. Place of residence, age group, gender, height, weight, marital status and economical status were incorporated in the study for risk factor analysis. A clean, labelled, wide mouthed screw capped plastic container was given to them for stool sample collection and were asked to provide one sample on the next morning (large teaspoon amount of solid stool or 10 ml of liquid stool) in the container given to them. The collected stool samples were transported to the laboratory on the same day and examined using direct (saline/iodine wet mount) and concentration (floatation/sedimentation) microscopic techniques. The slides were covered with coverslips and examined under low power (10X) and the doubtful structures were confirmed with 40X magnification [8-9]. Regarding income categories, all registered participants were divided into three categories namely low-income group category (monthly income up to Rs. 5000), average income category (monthly income Rs. 5001-15000) and high-income category (monthly income > Rs. 15000).

Statistical analysis: Chi square test (χ^2 test) of statistical significance was applied to study the association between prevalence of intestinal parasites and the demographic factors. Odds ratio (OR) and 95% confidence interval (95%CI) of values were also used. P value < 0.05 was considered as significant.

RESULTS

Based on the patients' clinical symptoms and signs, a total of 497 subjects were found eligible for the study. Of the 497 eligible subjects, only 434 persons were available to give stool samples. Out of 434 stool samples collected for intestinal parasitic infection, 203 (46.8%) were from rural area and 231 (53.2%) were from urban area. Age factor analysis revealed that 92 (21.2%) patients were below 5 years of age, 170 (39.2%) were between 5-18 years of age and 172 (39.6%) were above 18 years of age. The breakdown by gender revealed that 136 (31.3%) patients were female and 298 (68.7%) were male. Of the 434 patients, 174 (40.1%) were married while 260 (59.9%) were unmarried. 110 (25.3%) patients were from low-income group, 148 (34.1%) were from middle income group and 176 (40.6%) were from high income group. 99 (22.8%) patients were uneducated, 148 (34.1%) were 10^{th} and 12^{th} pass and 187 (43.1%) graduated. 344 (79.3%) patients had the facility of toilets in their homes but the remaining 90 (20.7%) patients did not. There were 116 (26.7%) patients who did not wear shoes and slippers while the remaining 318 (73.3%) had the habit of wearing shoes and slippers (Table-1, Fig-1). Out of a total of 434 stool samples tested for ova and cysts of intestinal parasites, 13.3% of the rural population and 4.8% of the urban population were found infected. Age factor analysis revealed that 17.4%, 6.5% and 6.0% of the subjects were observed positive in the age groups 1–5 years, 5–18 years and more than 18 years, respectively (Table-1, Fig-2).

Out of the total 434 stool samples tested for parasitic infection, 38 (8.8%) individuals were found positive. Of the 38 positive cases, four species of intestinal parasite were found, with *Ascaris lumbricoides* being the most common at 44.7%, followed by *Entamoeba histolytica* at 26.3%, *Ancylostoma duodenale* at 21.1%, and *Taenia solium* at 7.9% (Fig-3).

The prevalence of intestinal parasites was significantly higher in rural population (χ^2=9.8603, *d.f.*=1, *p*=0.0017), illiterate persons (χ^2=8.8169, *d.f.*=2, *p*=0.01217), children (χ^2=10.8982, *d.f.*=2, *p*=0.0043) and persons walking bare foot (χ^2=14.2688, *d.f.*=1, *p*=0.0002) as compared to urban population, graduated persons, adults and population using shoes and slippers during walking respectively (Table-1). Odds ratio (OR) and 95% confidence interval (CI) also suggests that rural population (OR 3.07, 95% CI: 1.48-6.36),

illiterate persons (OR 2.81, 95% CI: 1.27-6.21), children (OR 3.08, 95% CI: 1.36-6.96) and persons walking bare foot (OR 3.47, 95% CI: 1.76-6.83) are at greater risk as compared to urban population, educated persons, adults and population using shoes and slippers during walking respectively (Table -1). However, the prevalence of intestinal parasites was found to be higher in lower income groups and those populations that did not have a household toilet, compared to higher income groups and those populations that had a household toilet, although this was not statistically significant. No significant association was found between the prevalence of intestinal parasitic infection with gender and marital status (Table-1).

Table -1: Socio-demographic and behavioral characteristics of participants along with log regression analysis for finding the independent factors associated with intestinal parasitic infection in rural and urban population of District Bulandshahr (n-434).

Characteristics	Parasite positive (%)	Parasite negative	Total	Chi Square value	OR	95% CI
Place of residence				χ^2=9.8603		
Rural	27 (13.3)	176	203	*d.f.*=01	3.07	1.48-6.36
Urban	11(4.8)	220	231	p = 0.0017	1	
Gender				χ^2= 0.0011		
Female	12 (8.8)	124	136	*d.f.*=01	1.01	0.49-2.07
Male	26 (8.7)	272	298	p = 0.9731	1	
Income groups				χ^2= 8.3020		
< Rs 5000	17 (15.5)	93	110	*d.f.*=02	2.52, 2.74	1.11-5.75,
5001-15000	10 (6.8)	138	148	p =0.0157	1	1.23-6.1,
>15000	11 (6.7)	165	176		1	
Educational status				χ^2=8.8169		
Uneducated	16 (16.2)	83	99	*d.f.*= 02	2.66, 2.81	1.15-6.14
10^{th} & 12^{th} pass	10 (6.8)	138	148	p =0.0122	1	1.27-6.21
Graduated	12 (6.9)	175	187		1	
Age groups in yrs				χ^2= 10.8982		
< 5 Yrs	16 (17.4)	76	92	*d.f.* =02	3.04, 3.08	1.35-6.87
5 to 18 Yrs	11 (6.5)	159	170	p = 0.0043	1	1.36-6.96
> 18 Yrs	11 (6.0)	161	172		1	
Marital status				χ^2= 1.2567		
Unmarried	26 (10.0)	234	260	*d.f.* =01	0.67	0.33-1.36
Married	12 (6.9)	162	174	p = 0.2622	1	
Unavailability of toilet in house				χ^2= 2.9781		
Yes	12 (13.3)	78	90	*d.f.* =01	1.88	1.88-3.89
No	26 (7.6)	318	344	p = 0.0844	1	
Walking bare foot				χ^2= 14.2688		
Yes	20 (17.2)	96	116	*d.f.* =01	3.47	1.76-6.83
No	18 (6.0)	300	318	p = 0.0002	1	
Total	**38 (8.8)**	**396**	**434**			

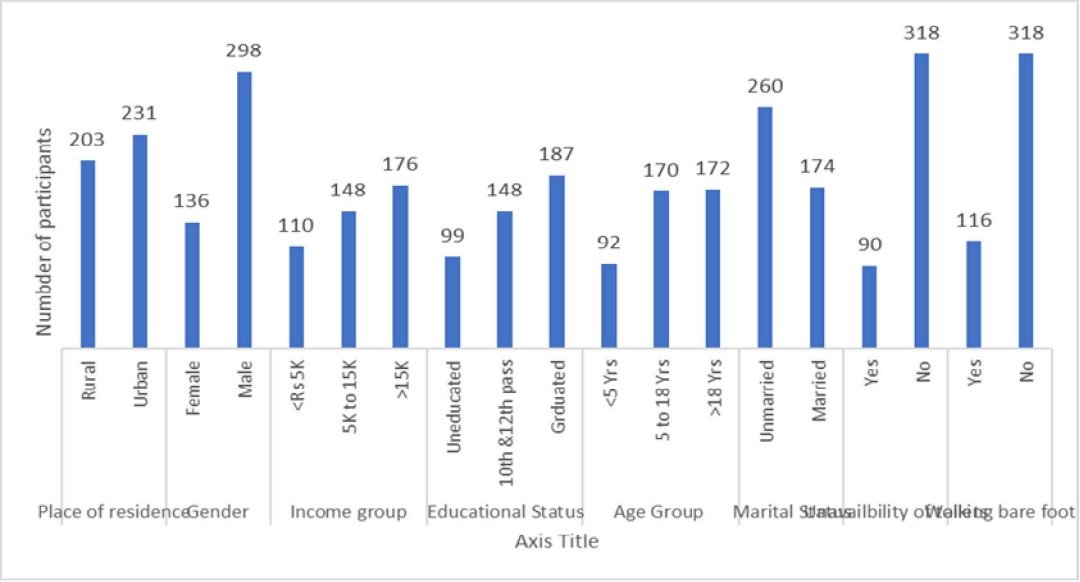

Fig-1. Distribution of participants in different categories of different characteristics

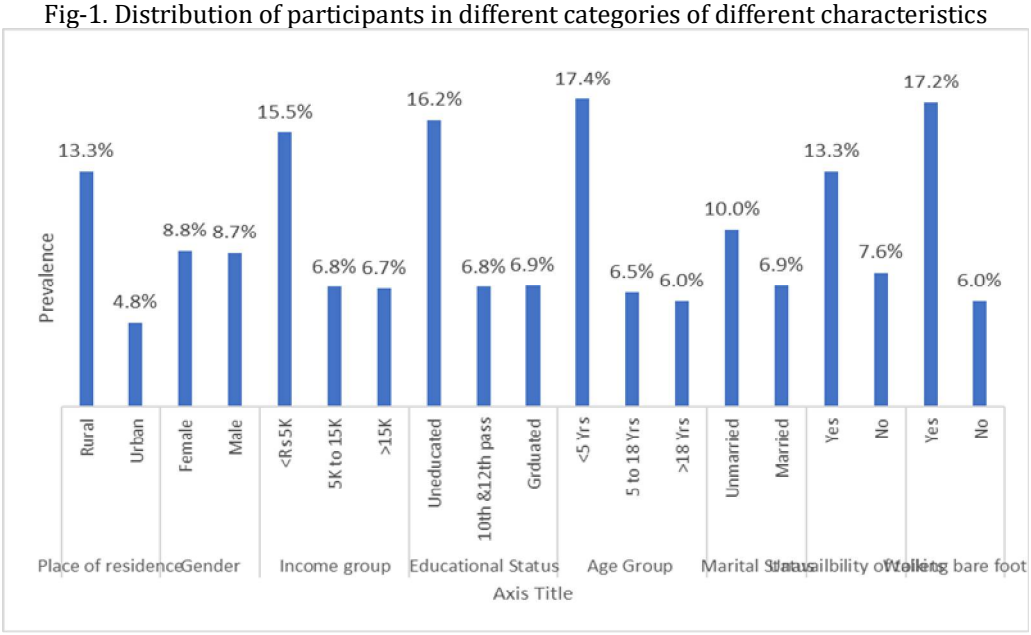

Fig-2. Prevalence of intestinal parasitic infection in different categories of different characteristics

Gender wise division showed that 8.8% and 8.7% patients were positive from female and males patients' groups respectively. Marital status showed that, 6.9% subjects were positive from married subjects and 10.0% were positive from unmarried subjects' group. 15.5 %, 6.8 % and 6.7 % patients were positive from low-income group, medium income group and high-income group respectively. According to availability of toilet at home, 13.3% people were positive from the group with no toilet facility at home and 7.6% from the group with toilet facility at home. 17.2% patients from the barefoot group were positive and only 6.0% patients from the shoe wearing group. Of the total 434 patients, 16.2%, 6.8% and 6.9% were positive from the groups of illiterates, 10th to 12th pass and graduate patients respectively (Table-1, Fig-2).

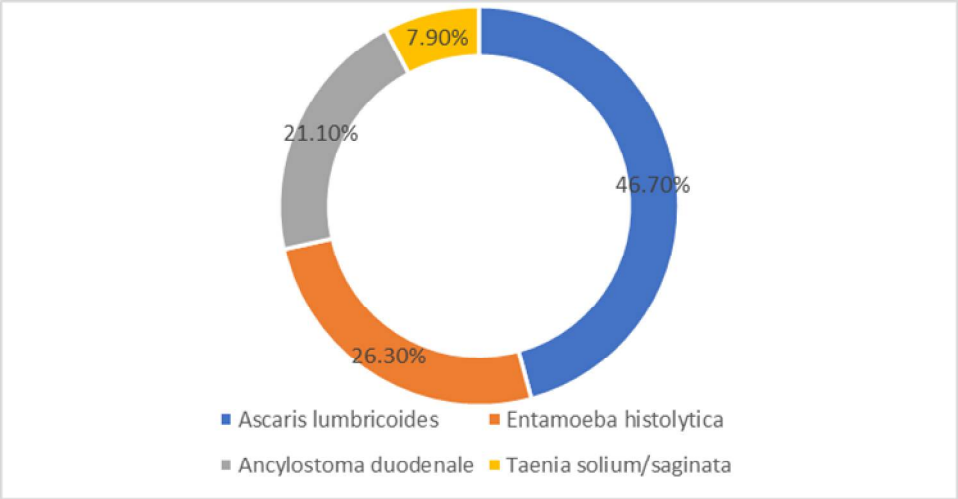

Fig-3. Percentage of intestinal parasitic infection

DISCUSSION

Intestinal parasitic infection continues a serious public health problem in developing countries like India, Nepal and Pakistan. Some of the morbid conditions attributed to intestinal parasitic infection are malnutrition, growth retardation, anemia and impaired intellectual performance. Impairment of physical and mental development have also been identified as a deleterious effect of helminthic infection [5]. Even in non-endemic areas, cases imported from endemic areas are causing problems. Stool examination remains the gold standard test for the laboratory diagnosis of ova, cyst and trphozoites of intestinal parasites [14].

The current study of intestinal parasitic infection from rural and urban population of Bulandshahr, Uttar Pradesh revealed the overall prevalence 8.8%. This is lower than the prevalence 15.86% observed in a hospital-based study conducted in the Parasitology section of the Department of Microbiology, Tirthankar Mahavir Medical College and Research Institute, Moradabad (UP) [14]. And this is also lower than the prevalence 26.4% detected in another community cross-sectional study conducted in households in Tonga Sub-division, West Region, Cameroon [10]. But it is higher than the prevalence 6.63% observed in a study conducted in Latur district of Maharashtra [6]. Present authors is of opinion that, in our study, first after identifying the symptoms of parasitic infection, stool examination was done and finally only microscopically confirmed cases and those where whole parasite was found were included in the study. For this reason our overall prevalence is lower than many studies and higher than many others.

Present study revealed the positive association between the prevalence of intestinal parasitic infection and rural population (χ^2=9.8603, *d.f.*=01, p=0.0017). The odds ratio (OR=3.07, 95% CI: 1.48–6.36) also suggests that rural populations have a higher risk of intestinal parasitic infection compared to urban populations. It is contrary to the observations of a studies in which the prevalence of intestinal parasitic infection was 3.3 times higher in urban areas compared to rural.[12] In our study, the population of the posh colonies of the urban area was also included. The population of urban areas is more affluent and more conscious about their health, where the condition of sanitation is also much better compared to rural areas. Therefore, it would be the possible cause of the low prevalence in urban area as compared to rural in our study. Similarly, higher prevalence of intestinal parasites was observed in rural population as compared to the urban population in a comparative study of intestinal parasites in children attending schools in a rural and urban population in and around Chennai [7]. Several other studies also revealed the similar findings of higher prevalence of intestinal parasitic infection in rural population compared to urban [15, 23].

Present study also revealed a positive association between the prevalence of intestinal parasitic diseases and the illiterate population (χ^2=8.8169, *d.f.*=02, p=0.01217). The odds ratio (OR=2.81, 95% CI: 1.15-6.14) also support the similar findings. A similar significantly positive association also reported in a study between the prevalence of intestinal parasitic diseases and the illiterate population [11]. Present authors are opinion that the illiterate population is mostly present in the poor class. In which there is almost no information about prevention of intestinal parasitic infection. And this is the reason why the prevalence of intestinal parasitic infection is high in this class.

The prevalence of intestinal parasitic diseases in the current study was found to be significantly higher in children under 5 years of age as compared to 5-18 years and more than 18 years of age group

participants (χ^2=10.8982, *d.f.*=02, *p*=0.0043). Odds ratio (OR=3.08, 95% CI: 1.36-6.96) also indicating that the prevalence of intestinal parasitic infection is lower in the adult population compared to the population under 5 years of age. Similarly, in a stool survey carried out in some villages of Dadraul and Bhawal Khera PHC's of district Shahjahanpur (Uttar Pradesh) showed the higher prevalence of intestinal parasites in the age groups between 6 to 14 years [24]. Findings of this study support the findings of present study. The present author is of opinion that children under the age of 5 do not understand how to prevent from parasitic infection. Also, children from poor families are less likely to maintain adequate personal hygiene and cleanliness. This is why this group falls into this high-risk group of parasitic infection. A positive association was also found between the prevalence of intestinal parasitic diseases and the barefoot walking population (χ^2=14.2688, *d.f.*=01, *p*=0.0002). The odds ratio (OR=3.47, 95% CI: 1.76-6.83) also revealed that populations that use shoes or slippers while walking have a lower prevalence of intestinal parasite infection than populations that walk barefoot. The above observations are consistent with another community-based study conducted from 15th Nov 2011 to 14th March 2012 in Government and private schools of Itahari Municipality, Nepal. In which significantly lower (*P*<0.001) prevalence rate of intestinal parasitic infection observed in children those wore shoes or slippers regularly (2.0%) than not wear (23.8%) [19]. Similar observation also reported in a study conducted in Ethiopia, in which the prevalence of intestinal parasite infection was significantly lower in the population wearing slippers or shoes (3.9%) compared to those who did not wear them (9.6%) [22]. Present authors are of opinion that as barefoot walking has been reported to be an important risk factor for the spread of infection, the general public should be made aware of the importance of wearing slippers or shoes while walking. They need to be made to understand that by using slippers and other good habits, they can avoid intestinal parasite infection and also reduce the chain of re-infection. Improving water sanitation and hygiene images in the study area and concurrently strengthening deworming services may result in low prevalence in the target population.

However, the prevalence of intestinal parasites was found to be higher in lower income groups and those populations that did not have a household toilet, compared to higher income groups and those populations that had a household toilet, although this was not statistically significant. Gender and marital status were not revealed any association as the risk factor of intestinal parasitic infections.

CONCLUSION

This study shows that intestinal parasitic infections are prevalent in the study area and require immediate control and preventive measures. The prevalence of intestinal parasites was observed high among rural population, uneducated population, children, and people who walk barefoot. Educating the population about the spread of intestinal parasitic infections and promoting good hygiene practices, wearing slippers or shoes while walking along with deworming services will have a substantial impact in the prevention of intestinal parasitic infections.

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Conflict of interest

Nil

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