Annals of Parasitology 2021, 67(2), 329–336
doi: 10.17420/ap6702.346

Original paper

Prevalence of intestinal parasites among Sarki ethnic group of Pala Rural Municipality, Baglung, Nepal

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ABSTRACT. Intestinal parasitic infections are among the major public and socioeconomic concerns that have adversely affected the well-being of the poor in developing countries. This research work aimed to inspect the prevalence of gastro-intestinal (GI) among Sarki ethnic group of Pala Rural Municipality, Baglung, Nepal. Total 498 stool samples collected in dry, screw capped clean plastic vails and studied for the presence of parasites using direct smear method as well as by concentration method. Overall parasite positive rate was found to be 31.32% (156/498). The prevalence of single infection was higher than double infection among Sarki ethnic group. There were no significant differences in prevalence of parasites among different age-groups, sexes and villages. Positive rate was considerably higher in females (47.5%; 38/80) compared with males (32.5%; 26/80) ($P<0.05$). Altogether six genera of parasites were encountered. Of them, *Trichuris trichura* (53.20%; 264/498) was the most prevalent parasite followed by *Ascaris lumbricoides* (33.97%; 169/498), *Entamoeba coli* (4.49%; 22/498), *Taenia* sp. (3.21%; 16/498), *Strongyloides stercoralis* (2.56%; 13/498) and *Hymenolepis nana* (2.56%; 13/498). Remarkable prevalence of intestinal parasitic infection was indicated by the present study carried out among Sarki ethnic group of Pala Rural Municipality, Baglung district of Nepal.

Keywords: intestinal parasites, protozoans, helminths, ethnic group, Pala

Introduction

Intestinal parasitic infections are among the major public and socioeconomic concerns that have unpleasantly affected the well-being of the underprivileged in developing countries as they can lead ill health and death [1]. Despite of using medicines by more than one third of population in South East Asian region, still 13% of mortality in this region are associated to parasitic infections only [2]. Prevalence in some areas of Nepal, India and other foreign countries has been stated to be in elevation (>90%) [3–6], while reasonably less in somewhere else in Nepal (20.7%) [7].

Soil-transmitted GI infections are revealed to be extensively distributed by studies in several rural areas of Nepal where lack of education and public awareness [8], open defecation [8] and lack of safe drinking water [8] as well as poverty are prevalent [8]. Climate enhances the transmission of these infections, with sufficient moisture and warm temperature essential for molting of larva in the soil [9]. Some parasitic protozoan and helminths species are familiar to cause GI infections to human [9].

It has been predicted that *Trichuris trichura*, hookworm and *Ascaris lumbricoides* infect, 1,050 million, 1,300 million and 1,450 million people worldwide, respectively, while schistosomosis affects over 200 million people [10]. Globally, two billion individuals were infected with intestinal parasites; out of these majorities were children due to malnutrition. GI parasites are major public health problem in Nepal [11,12]. Children are particularly vulnerable to GI parasites and carry higher loads of parasites in them [13]. The reported prevalence of intestinal parasites varies from place to place and time to time. In Nepal, the prevalence ranges from 27% to 76.4% in different studies carried out among general population in different geographical areas [14,15], whereas, hospital records in Nepal showed the infection rate of 30.0–40.0% [14]. More than half population of the world reportedly lives in

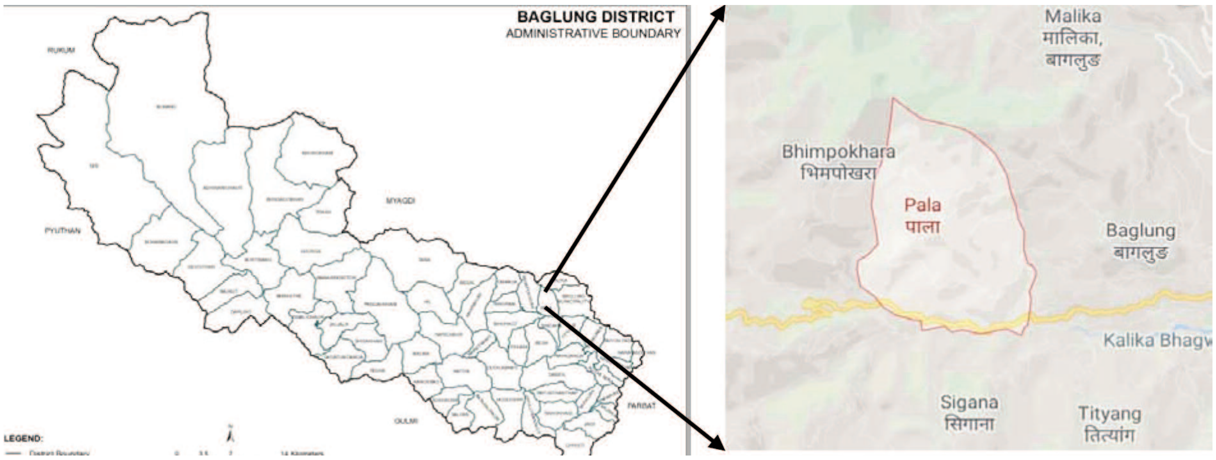

Figure 1. Map of Baglung district (left) and Pala Rural Municipality (right)

misery and discomfort, and suffers vast financial loss attributed to parasitosis alone [4]. The intestinal parasitosis seems to be one of the foremost health problems among Sarki ethnic group in study area as well [16]. So, the main aim of this research work was to inspect whether the intestinal parasites are more prevalent among Sarki ethnic group of Pala Rural Municipality, Baglung, Nepal.

Materials and Methods

Study area

The study area, Pala Rural Municipality lies in Baglung district and has an area of total 1784 km^2 with residence of 2,68,613 populations. Sarki ethnic group has the total population of 1,29,745 in western hilly eco-development region including the study area [17]. Ethnicities such as Brahmin, Magar, Chhetri, Chhantyal and Dalits are those groups mainly residing in this area [18]. Average annual temperatures range from a maximum 26.6°C and a minimum of 19.1°C. Highs above 35°C (95°F) and falls below 0°C (32°F) are rare. The recorded annual average rainfall is 1060.9 ml [18].

Stool collection and processing

Systematic Random Sampling technique was applied in selection of individual for the sample and data collection from Sarki ethnic group of selected area. The people were taught in brief about the importance of the examination of stool to detect the parasite and how to collect stool samples with the aid of their family members. After the proper instruction for stool sample collection method, labeled collection vials and application sticks were provided to them. Everyone was instructed to collect about 10 g of fresh stool. Labeling and quantity was checked in every specimen. Potassium-dichromate solution (2.5%) was used to preserve the portion of stool samples and brought to the laboratory at Baglung hospital, then immediately processed to find cysts, trophozoites, eggs and larva of intestinal parasites by direct smear method [19] and concentration method [20].

Direct smear examination was done for the detection and identification of helminths eggs or larva and protozoal cysts, oocytes, trophozoites by wet preparation i.e. unstained smear preparation and stained smear preparation [19]. Unstained smear preparation of sample was prepared by taking a drop of normal saline in a clean glass and 1–2 drops of stool sample was mixed over it to make it thin and clear, then observed under microscope [19]. For stained smear preparation of sample, a drop of 5 times diluted Lugol's iodine solution was taken on a glass slide and mixed 1–2 drops of stool sample with it. The preparation was then observed under microscope [19]. Beside the direct stool smear preparation and examination method, for some doubtful samples, indirect method (sedimentation and floatation technique) of examination was also applied. The faecal samples were examined by concentration technique (Floatation and Sedimentation). A beaker was used where nearly 42 ml of water was mixed with about 3 gram of faecal sample and then filtered. For around 5 minutes, the filtrate solution was centrifuged. NaCl was used to saturate the filtrate and again filtrate was centrifuged. The mixture from top was examined by adding methylene blue and the sediment was stained with iodine solution to detect eggs, trophozoites and cysts of parasites [20,21].

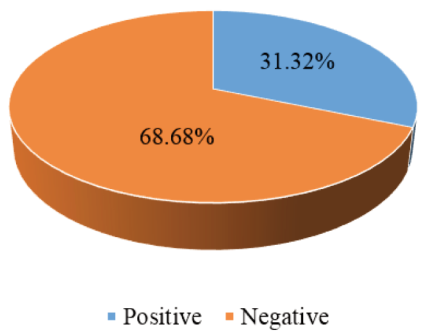

Figure 2. General prevalence of intestinal parasites

squared test performed by R 3.4.1 version software package [23]. P<0.05 was considered for the statistically significance difference.

Results

General prevalence of intestinal parasites

A total of 498 stool samples were collected from three different sites of Pala Rural Municipality and examined from June to July 2018. Out of 498 stool samples, 156 samples were positive, and 342 samples were negative (Fig. 2).

Table 1. Sex-wise prevalence of parasite in Sarki ethnic group

Sex	No. of samples examined	Positive cases n (%)	Negative cases n (%)	χ^2	*P*
Male	212	62 (29.24)	150 (70.76)	0.58	0.44
Female	286	94 (32.86)	192 (67.14)		

Statistically no significant difference was found in prevalence of parasites between male and female (P>0.05)

Table 2. Age-wise prevalence of intestinal parasites among Sarki ethnic group

Age groups	No. of samples examined	Positive cases n (%)	Negative cases n (%)	χ^2	*P*
1–15 years	193	69 (35.75)	124 (64.25)		
16–30 years	157	40 (25.47)	117 (74.53)		
16–30 years	157	47 (31.75)	101 (68.25)	4.27	0.11

There was statistically no significant difference in the prevalence of parasites between different age groups (P>0.05)

Calibration of eggs, cysts and larva

Ocular and stage micrometer were used for alibration of length, breadth and diameter of parasites eggs, cysts and larva. They were measured with the calibration factors.
Calibration Factor (C.F.) for 10×=10.37 micrometer
Calibration Factor (C.F.) for 40×=2.588 micrometer

Identification of the eggs, cysts and larva

The identification and confirmation of the eggs, cysts and larva were made by comparing the structure, color, size of eggs, cysts and larva from published books and journals [22].

Statistical analysis

The collected data from the field survey and laboratory reports were statistically analyzed with the help of Microsoft Excel 2016 and Pearson's Chi-

Sex-wise prevalence of parasites

All samples were categorized into male and female gender groups. The overall sex-wise prevalence of intestinal parasites was found the highest among females and lowest among males (Table 1).

Age-wise prevalence of intestinal parasite

All samples were categorized into 1–15 years, 16–30 years and 31–70 years groups. The overall age-wise prevalence of intestinal parasites was found the highest among 1–15 years and lowest among the age group of 16–30 years (Table 2).

Village-wise prevalence of specific intestinal parasites

Stool samples from Chhapa village showed highest infection rate (61/156, 39.10%) which is

Table 3. Village-wise prevalence of specific intestinal parasites

Parasites	Positive cases		
	Chhapa n (%)	Chautaramuni n (%)	Chihandada n (%)
T. trichura	39 (63.30)	27 (53.33)	18 (40.00)
A. lumbricoides	14 (22.95)	17 (33.33)	22 (48.00)
E. coli	3 (4.91)	2 (4.44)	2 (4.00)
Taenia sp.	2 (3.27)	1 (2.22)	1 (2.00)
H. nana	2 (3.27)	1 (2.22)	1 (2.00)
S. stercoralis	1 (1.63)	2 (4.44)	1 (2.00)

followed by Chihandada village (50/156, 32.05%) and Chautaramuni village (45/156, 28.85%) (Table 3).

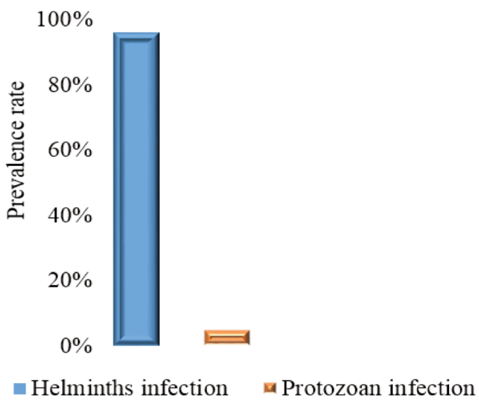

Figure 3. Distribution of protozoan and helminth infections

Table 4. Prevalence of specific intestinal parasites

S.N.	Parasites	No.	Infected %
	Helminths		
1.	*T. trichura*	84	53.85
2.	*A. lumbricoides*	53	33.97
3.	*Taenia* sp.	4	2.56
4.	*H. nana*	4	2.56
5.	*S. stercoralis*	4	2.56
	Protozoan		
6.	*E. coli*	7	4.49

Distribution of protozoan and helminth infection

Of total 156 positive samples, the distribution of helminth infection 149 (95.51%) were higher than the protozoan infection 7 (4.49%) (Fig. 3).

Prevalence of individual intestinal parasites

Total six intestinal parasites were recorded among them, *T. trichura* was higher prevalent in Sarki ethnic group followed by *A. lumbricoides*, *E. coli*, *Taenia* sp., *H. nana* and *S. stercoralis* (Table 4).

Intensity of double infection

Double parasitic infection was reported as 4.49% (29/156) in total positive samples where equal rate of prevalence of double parasites were observed (Table 6).

Discussion

Among the identified parasites in the stool samples, gastrointestinal parasites in Sarki ethnic group such as helminths (*T. trichura*, *A. lumbricoides*, *Taenia* sp., *H. nana* and *S. stercoralis*) and protozoan (*E. coli*) were leading, probably due to drinking untreated water, lack of education, poor hygienic environment and underprivileged socio-economic situation of family. This assumption can be supported by the occurrence of gastrointestinal parasites among the public and private school pupil in rural area of southern Nepal [24], in suburban public school pupil in Kathmandu, Nepal [25] in northeastern part of Kathmandu valley [26], in a countryside of Kathmandu Valley [15] and in pupil in public and private school [27]. Therefore, it seems to be attributed to lack of toilets, open defecation and tap water as the main source of drinking water [28].

Table 5. Intensity of single infection

S.N.	Parasites	No.	% of + ve cases	No. of infected male	No. of infected female
1.	*T. trichura*	68	53.54	33	35
2.	*A. lumbricoides*	44	34.65	21	23
3.	*E. coli*	6	4.73	2	4
4.	*Taenia* sp.	3	2.36	1	2
5	*H. nana*	3	2.36	1	2
6	*S. stercoralis*	3	2.36	1	2
	Total	127	100	59	68

Table 6. Intensity of double infection

S.N.	Parasites	No.	% of + ve cases (n=29)
1.	*T. trichura + A. lumbricoides*	9	31.03
2.	*T. trichura + E. coli*	1	3.45
3.	*T. trichura* + *Taenia* sp.	1	3.45
4.	*T. trichura + H. nana*	1	3.45
5.	*T. trichura + S. stercoralis*	1	3.45

No significant difference was documented in prevalence of GI parasitic infection among males and females of Sarki ethnic group. This finding resembles with the parasitic infection in pupil in Thimi area Kathmandu valley [29]. This finding resembles with many studies in Nepal [30–34] somewhere else by [35]. This indicates that, both males and females are vulnerable to parasitic infection, may be because the infection in individual is determined by the other factors like family income, sewage disposal quality, nutritional status and behavioral characteristics [36–38] which may present equally in both sides.

There was no significant difference in prevalence of GI parasitic infection among different age group of Sharki ethnic group. This finding is matches with the finding of parasitic infection in pupil in Thimi area Kathmandu valley [29] and many other studies in Nepal [30–34] and in pupil in Haiti [35]. This indicates that, all age group are vulnerable to parasitic infection because the infection in individual is determined by lack of sanitation, sewage disposal quality, nutritional status and behavioral characteristics [36–38]. Also, Stool samples from Chhapa village showed highest infection rate which is followed by Chihandada village and Chautaramuni village.

The present finding estimated 31.32% prevalence rate of GI parasites which resembles with study in school children in public and private school [27], contradicts with prevalence rate reported by [33], higher than the studies reported by [8,34]. Prevalence of infections was higher for helminths (95.51%) compared to protozoa (4.49%). *T. trichura* noted as the higher rank (53.85%) among all listed parasites. Contrary result was also showed by the previous studies [27,31,39–42]. It is probably due to over distribution of *Trichura* and *Ascaris* egg in the surroundings as about 0.2–0.25 million eggs are laid by single female worm and as well poor hygiene habits facilitating in its chances [8]. Whereas, this study depicts protozoan infection as less prevalent as only *E. coli* was recorded. On contrary, study in school children in the northeastern part of Kathmandu valley [26], school children in remote hilly areas in Nepal [43] and children of western Nepal [44] had reported *E. coli* as the most common protozoan parasite. This contradiction in finding probably due to consumption of contaminated water, due to close running of water pipe and sewage line in Kathmandu [44].

The present finding was maximum for single parasitic infection (81.41%) and (18.59%) were detected as double parasitic infection from examined subjects. The given result was in agreement with the studies in Nepal and elsewhere in world [8,27,45–48]. In contrast, some studies had reported higher prevalence of multiple infections [26,49]. In this study, *T. trichura* + *A. lumbricoides* (31.03%) was documented as prevalent in total double parasitic infections. A study done by [45] had stated higher rate of infection due to *A. lumbricoides* + hookworm, which is an opposite to present finding.

In conclusion, almost 31.05% were recorded as positive cases where helminth parasitic infection was more prevalent than protozoan parasitic infection. Altogether six species of parasites were encountered with *T. trichura.* As the most prevalent GI parasite. Intensity of single infections was more than double infections. The prevalence rate of infection was found higher among the female than in male. In village-wise prevalence, Chhapa village showed marginally higher prevalence compared to Chihandada and Chautaramuni. This shows that GI parasitic infections are still prevalent as a major health problem among Sarki communities. Transmissions of infections were generally due to poor sanitary habit, use of contaminated water, somewhat lack of knowledge related infections.

Based on the results, discussions, and conclusions derived from the present study, following recommendations have been suggested for the effective control of intestinal parasites among the Sarki ethnic group of Pala Rural Municipality, Baglung.

There is higher prevalence of intestinal parasites due to lack of personal hygiene, open defecation, use of contaminated food, water and soil, etc. Thus proper personal hygiene, education, awareness programs should be conducted.

Molecular study should be done for the identification of parasites in species level.

Acknowledgements

The authors are thankful to the Sarki ethnic group of Pala Rural Municipality for providing samples and cooperating during the work. Authors are also thankful to Central Department of Zoology, Tribhuvan University and Baglung Hospital for providing lab and necessary materials.

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Received 13 September 2020
Accepted 13 April 2021