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Prevalence and Associated Risk Factors of Protozoan Infections among the Tea Estates Workers of Ilam District, Nepal

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Abstract

Introduction: Intestinal protozoan infections continue to remain a global public health challenge, particularly in developing countries. Since diagnosis of these parasites is difficult, prevalence data on intestinal protozoa is scarce. **Objectives:** To measure the prevalence of intestinal Protozoan Infections and to identify risk factors associated with Protozoan Infections among the tea garden workers in Ilam district of Nepal. **Materials and Methods:** A Community based cross-sectional study was conducted among tea garden workers in Ilam district of Nepal. Out of 4 tea estates in Ilam District, 2 tea estates (Ilam Municipality and Kanyam) were selected randomly. Out of total 150 tea workers (30 in Ilam Municipality and 120 in Kanyam), 98 workers participated in the study. Semi-structured questionnaire was used and routine examination of stool was done. Collected data was entered in Microsoft excel and analysed. **Results:** Prevalence of protozoan infections among the Tea Estates workers of Ilam District was 22.4%. *Giardia lamblia* was seen higher (12.2%) than *Entamoeba histolytica* (10.2%). Regarding ethnicity, the protozoan infection was seen higher among Dalit (40%) than Janajati (18.8%) and Brahmin/Chhetri (11.1%) ($P<0.05$). The protozoan infections was seen lower who use of soap and water after defecation (6.2%) than those using only water (60%) ($P<0.001$). The protozoan infections was also seen lower who wear sandals or shoes (17.3%) than those did not wear (47.1%) ($P<0.05$). The protozoan infection was seen higher among those having the habit of nail biting and thumbs sucking. **Conclusions:** There is relatively high prevalence of intestinal protozoan infection among the Tea garden workers in Ilam District of Nepal. This obviously suggests that there is possible poor personal hygiene, sanitation, and behavior oriented risk factors which predispose the workers to these parasites.

Keywords: Ilam, Intestinal Protozoan Infections, Prevalence, Risk factors, Tea Estates Workers

1. Introduction

Intestinal parasitic infections are among the most common infections in the world and are responsible for considerable morbidity and mortality[1]. The epidemiology of intestinal parasitic infections shows that these parasites are found in every age group and in both sexes. Human intestinal parasitic infections have a worldwide distribution, with the greatest incidence and intensity occurring in developing countries[2].

The global burden of intestinal protozoan infestation is still huge even though there have been tremendous achievements in the reduction of their prevalence. About 50 million people are currently living with *Entamoeba histolytica* while close to 3 million others are infected with *Giardia lamblia*[3]. Prevalence of *Cryptosporidium parvum* ranges between 2-50% globally[4]. *Entamoeba histolytica* has been recovered worldwide and is more prevalent in the tropics and sub-tropics than in colder climates. However, in poor sanitary conditions in temperate and colder climates, infection rates have been found to equal that seen in the tropics[5]. *Giardia lamblia* also has a worldwide distribution with an incidence rate of between 11% and 30%[6].

Much attention has been paid to enteric protozoa in human infections in developing countries, where poor sanitary conditions and the unavailability of effective water treatment have sustained conditions for their

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transmission[7]. Climate change is predicted to influence changes in precipitation quantity, intensity, frequency, and duration and subsequently affect environmental conditions that predispose developing countries to the transmission of waterborne disease[8]. Thus the current study was carried out to find the prevalence of Protozoan Infections and to explore the possible risk factors related to the presence of Protozoan Infections.

2. Methodology

A Community based cross-sectional study was conducted from 13th December 2015 to 27th December 2015 in tea garden workers in Ilam district of Nepal. This was a two weeks study to fulfill epidemiological management carried out by students of MBBS 3rd year Batch 2013 of B. P. Koirala Institute of Health Sciences, Dharan, Nepal. Ilam District was chosen randomly to conduct this research. Four tea estates under Nepal Tea Development Cooperation (NTDC) at Ilam District are Ilam Municipality, Kanyam, Soktim and Chilimkot. Out of 4 tea estates of Ilam District, 2 tea estates (Ilam Municipality and Kanyam) were selected randomly. Out of total 150 tea workers (30 in Ilam Municipality and 120 in Kanyam), 98 workers participated in the study.

Ethical clearance was taken by Institutional Review Committee of B P Koirala Institute of Health Sciences, Dharan, Nepal. Written permission was taken from each incharge of Nepal Tea Development Cooperation (NTDC) at Ilam Municipality, Kanyam, and participants. This study was included the tea garden workers of both sexes, aged 18 years and above, having working experience of minimum 6 months and those who gave written consent.

Semi-structured questionnaire was used and routine examination of stool was done. More than 15 workers were enlisted in each visit & equal number of bottles was given to collect stool and collected next day. Slide preparation was done using Normal Saline and Lugol's Iodine to detect the ova of protozoa. Then we examined ova of different protozoa by using Microscope[9]. Confidentiality and privacy of the study was maintained; name of the individuals or participating group was not disclosed after the study.

All interviewed questionnaires were indexed and kept on file. Data was entered in Microsoft Excel and converted into SPSS (Statistical Package for Social Science) 11.5 version for statistical analysis. The prevalence was calculated, Chi-square test was used to measure the association between risk factors and intestinal protozoan infections. The confidence level was set at 5% in which probability of occurrence by chance is significant if $P<0.05$ with 95% confidence interval.

3. Results

Table 1 shows the status of protozoan infections among the Tea Estates workers of Ilam District. Prevalence of protozoan infections was seen 22.4%. *Giardia lamblia* was found to be higher (12.2%) than *Entamoeba histolytica* (10.2%).

Table 1. Study subject by different protozoan Infections

Characteristics	Frequency	Percent
Protozoan Infections	22	22.4
Yes	76	77.6
No	98	100.0
Total		
Name of Protozoa	10	10.2
Entamoeba histolytica	12	12.2
Giardia lamblia		
Total	**22**	**22.4**

Table 2. Distribution of study subject by sociodemographic variables with protozoan Infections

Variables	Protozoa		Total	P-Value
	Positive	Negative		
Age				
18-40 years	9 (19.6)	37 (80.4)	46	0.388
41-60 years	10 (22.2)	35 (77.8)	45	
>60 years	3 (42.9)	4 (57.1)	7	
Gender				
Male	6 (26.1)	17 (73.9)	23	0.633
Female	16 (21.3)	59 (78.7)	75	
Religion				
Hindu	15 (20.5)	58 (79.5)	73	0.441
Others (Muslim, Buddhist, Christian)	7 (28.0)	18 (72.0)	25	
Ethnicity				
Brahmin/Chhetri	4 (11.1)	32 (88.9)	36	0.016
Janajati	6 (18.8)	26 (81.2)	32	
Dalit	12 (40.0)	18 (60.0)	30	
Education				
Illiterate	13 (22.0)	46 (78.0)	59	0.922
Below SLC	7 (21.9)	25 (78.1)	32	
SLC & above SLC	2 (28.6)	5 (71.4)	7	
Total	**22 (22.4)**	**76 (77.6)**	**98**	

SLC: School leaving certificate

The prevalence of protozoan infection was seen slightly higher in male than female but the difference was not significant. The respondents from Dalit were found to have higher prevalence of protozoan infection than other ethnic groups (P<0.05) (Table 2).

Table 3 shows the study population using soap and water before meal and after defecation had significantly lower infection rate of protozoa in comparison to those using water only (P<0.05). The study population who did not wear sandal or shoes showed higher prevalence of protozoan infections than those wear sandal or shoes (P>0.05). The association was seen among the unhygienic skin cleanliness and protozoan infection (P<0.05).

Table 3. Distribution of study subject by personal hygiene and fooding pattern with protozoan Infections

Variables	Protozoa		Total	P-Value
	Positive	Negative		
Drinking water carry from				
Stream	8 (38.1)	13 (61.9)	21	0.117
well	4 (25.0)	12 (75.0)	16	
Tap	10 (16.4)	51 (83.6)	61	
Water treat before drinking				
Yes	15 (19.2)	63 (80.8)	78	0.132
No	7 (35.0)	13 (65.0)	20	
Hand wash before meal				
No wash	5 (41.7)	7 (58.3)	12	0.008
Water only	9 (39.1)	14 (60.9)	23	
Soap	8 (12.7)	55 (83.3)	63	
Bath				
Regular	3 (15.8)	16 (84.2)	19	0.438
Irregular	19 (24.1)	60 (75.9)	79	
Have latrine				
Yes	11 (14.7)	64 (85.3)	75	0.001
No	11 (47.8)	12 (52.2)	23	
Hand wash after defecation				
Soap	4 (6.2)	60 (93.8)	64	<0.001
Water only	6 (60.0)	4 (40.0)	10	
Nothing	12 (50.0)	12 (50.0)	24	
Sandal wear				
Yes	14 (17.3)	67 (82.7)	81	0.007
No	8 (47.1)	9 (52.9)	17	
Skin				
Clean	9 (13.8)	56 (86.2)	65	0.004
Not clean	13 (39.4)	20 (60.6)	33	
Nail				
Cut clean	7 (16.7)	35 (83.3)	42	0.235
Uncut & Unclean	15 (26.8)	41 (73.2)	56	
Clothes				
Clean	16 (24.6)	49 (75.4)	65	0.471
Not clean	6 (18.2)	27 (81.8)	33	
Nail Biting				
Yes	8 (42.1)	11 (57.9)	19	0.022
No	14 (17.7)	65 (82.3)	79	
Thumb Sucking				
Yes	13 (50.0)	13 (50.0)	26	<0.001
No	9 (12.5)	63 (87.5)	72	
Food Habit				
Vegetarian	2 (66.7)	1 (33.3)	3	0.062
Non-Vegetarian	20 (21.1)	75 (78.9)	95	
Cooking duration				
< 30 min	6 (42.9)	8 (57.1)	14	0.048
≥ 30 min	16 (19.0)	68 (81.0)	84	
Antihelminthic drugs taken				
Yes	8 (18.6)	35 (81.4)	43	0.420
No	14 (25.5)	41 (74.5)	55	
Total	**22**	**76**		
	(22.4)	**(77.6)**	**98**	

4. Discussion

Many intestinal protozoan parasites inhabit the gastrointestinal tract of humans[10]. However, majority of them are non-pathogenic commensals or only result in mild disease while a few of them such as *Cryptosporidium parvum*, *Entamoeba histolytica* and *Giardia lamblia* are pathogenic and have been associated with human gastrointestinal disorders worldwide[10]. Transmissions of these pathogens to man is through contaminated water, oo (cysts) passed by food handlers (in homes, eating places on streets), flies and faeco-oral contamination[11].

The infection rate of protozoa was found to be 22.4 percent which was lower than study conducted by Farag H, et al. in Yemen Arab Republic (53%)[12], reports from Saudi Arabia (27.8%-32.2%)[13,14], Mehraj V, et al. in Pakistan (52%)[15], Alyousefi NA, et al. in in Sana'a City, Yenen (30.9%)[16], Walana W, et al. in Ghana (42.9%)[17] but higher than studies conducted by Sayyari, et al. in the Islamic Republic of Iran (19.9%)[18], Prakash K, et al. in in Dhahira region, Oman (18%)(19), Abebe A, et al. (13.4%)[20] respectively.

The prevalence of protozoan infection was seen higher in male (26.1%) than female (21.3%) (P>0.05).

Study carried out by Walana, et al. in Ghana revealed the infection rate of protozoa was significantly common among male (55.8%) than female (30.8%)[17]. Another study conducted by Traoré, et al. in Côte d'Ivoire reported a considerably higher prevalence of intestinal protozoa among boys than girls[21]. But Ezeama and Umeche showed higher prevalence of in female than male, this is in contrary to current finding[22]. Other studies found no gender difference at all[23]. This showed that the increased mobility of the male increases the risk of infection among them, while female have more soil contact during growing vegetables and eat raw vegetable with prepared food more often than males.

This study showed the infection rate of protozoa was higher in study population who use drinking water from stream (38.1%) than well (25%) and tap (16.4%) respectively but the difference was not significant. The results of other study also did not showed a significant positive association between the source of drinking water and Protozoa[24]. Previously, the using of well water has been identified as significant predictors of *E. histolytica* and *Giardia* infections in Saudi Arabia. Comparatively, those who use desalinated water have the lowest degree of exposure to the risk of infection[25]. Faecal matter and their offensive odour are also common sight and perception around some water sources. The implication is that, contamination by protozoans due to surface run-offs, floods as well as users with poor personal hygiene and dirty habits prevails[24].

The prevalence of protozoan infection was seen lower in study population who treat water before drinking (19.2%) in comparison to those did not treat (35%) (P>0.05). With regards to *Giardia* infection, it has been shown to be significantly associated with drinking untreated water. In Yemen, ground water is the main source of drinking water. Given that most of the homes are without a proper sanitary system, the possibility of faecal contamination is high via ground seepage[26]. Water contamination has been reported to be the source of infections in most communities with outbreak of parasitic diseases[27].

The study population using soap and water before meal had significantly lower prevalence of protozoan infections (12.7%) than those using only water (39.1%) (P<0.05). As for protozoan infection, the present findings showed that those who do not practice proper hand washing before eating was at two fold higher risk of acquiring protozoan infection. The major role of contaminated hands in the faecal oral transmission of diseases has been well documented in developing countries and washing hands before eating or after defecation has been considered as a secondary barrier. In Indonesia, it has been reported that people who never or sometimes wash hands had a four times higher risk of getting severe diarrhea[28]. In Nepal, the practice of hand washing had a strong correlation with the prevalence of parasitic infection[29]. The association between the frequency of hand washing and the positivity of protozoan infection in the health professionals was observed in other study[30]. It is expected that higher frequency in hand washing decreases the likelihood of the presence of pathogens. However, factors such as water quality and the procedure used in hand washing can be critical in determining the presence of intestinal protozoan cysts and thus, leading to the contamination of these professionals[30].

The infection rate of protozoa was higher in study population who bath irregular (24.1%) than regular (15.8%). A study conducted by Alyousefi NA, et al. in Sana'a City, Yemen showed that people who bath regular were 2 times lower risk of getting protozoan infection. The water crisis leads to the low hygienic practices, can cause increase of parasitic diseases[16].

The prevalence of protozoa was significantly lower in study population those were using toilet (14.7%) than not using (47.8%) (P<0.05). The availability of toilets/latrines is important in determining the prevalence of protozoa organisms in a given domain[31]. This is because; if these are absent, faecal matter with offensive odour and unpleasant sight would litter the household surroundings. The faecal matter bearing pathogenic parasites could contaminate surface drinking water sources, vegetables and fruits during overland run-offs or be blown into food sources during windy thunder storms. This was truly evident in Benue state, Nigeria where respondents who reportedly had no toilet in their homes and defecate in open field or their surroundings, where 4 times more infected as those who had latrines with cover in their home[31].

The study population using only water after defecation had significantly higher infection rate of protozoa (60%) in comparison to those using soap and water (6.2%) (P<0.001). The findings of this study showed that respondents who reportedly did not wash their hands with soap after using the toilet were 5.78 times more likely to be infected as those who wash their hands with soap after using the toilet[24]. Soap in conjunction with soft water if properly applied remove dirt and contaminants

of any kind[32]. Respondents had the highest prevalence of protozoan infections among those who after using the toilet did not wash their hands with soap and did not wash their hands at all[24].

5. Conclusion

The overall prevalence of intestinal protozoan infection was found to be high among the Tea Estates workers in Ilam District of Nepal. Risk factors like Dalit in ethnicity, not using soap before meal and after defecation, not using latrine, not wearing sandals and shoes, unhygienic skin cleanliness, habit of nail biting and thumb sucking, and cooking duration less than 30 min are positively associated with protozoan infestation. Health education regarding hygienic practices can have substantial effect in prevention of protozoan infection among the workers.

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