ISSN 2348 – 0319 International Journal of Innovative and Applied Research (2018)
Volume 6, Issue 02
33-39

Journal home page: http://www.journalijiar.com

INTERNATIONAL JOURNAL
OF INNOVATIVE AND APPLIED RESEARCH

RESEARCH ARTICLE

A STUDY OF PREVALENCE OF INTESTINAL PARASITES AND ASSOCIATED RISK FACTORS AMONG THE SCHOOL CHILDREN OF BIRATNAGAR SUBMETROPOLITAN, EASTERN REGION OF NEPAL.

Ram Bilakshan Sah[1], Ratna Baral[2] and Nilambar Jha[3].

1. Additional Professor, School of Public Health and Community Medicine, BPKIHS, Dharan, Nepal.
2. Additional Professor, Dept. of Microbiology, BPKIHS, Dharan, Nepal.
3. Professor, School of Public Health and Community Medicine, BPKIHS, Dharan, Nepal.

***Corresponding Author:-* Ram Bilakshan Sah.**

Abstract:

Introduction: Intestinal parasitic diseases constitute a global health burden in numerous developing countries mainly due to fecal contamination of water and food, lack of adequate basic sanitation, environmental and socio-cultural factors enhancing parasitic transmissions. **Objectives:** To measure the prevalence of intestinal parasitic infestation and to identify risk factors associated with parasitic infestation among the school children of Biratnagar Submetropolitan. **Materials and Methods:** The cross-sectional study was conducted in Grade VI, VII and VIII in Government and private schools of Biratnagar. Stratified random sampling method was applied to choose the schools and the study subjects. The Chi-square test was used to measure the association of risk factors and parasitic infestation. **Results:** Overall prevalence of intestinal parasitic infestation among the school children was 35.5 percent. Around 15.5% of the study population was found to be infested with helminthes and 20% of the study population was protozoa infected. Hookworm species was found higher (6.5%) in comparison to other worms i.e. Ascaris lumbricoides (5.5%), Trichuris trichuria (2.5%) and Hymenolepsis nana (1.0%). Regarding protozoal infestation, Giardia Lamblia was seen higher (12.5%) followed by Entamoeba histolytica (7.5%). Irregular bath, not using soap after defecation, not wearing sandals, unhygienic skin, nail and clothes cleanliness, habit of nail biting and thumb sucking were found to be significant relationship in the causation of intestinal parasitic infestation. **Conclusions:** The prevalence of intestinal parasitic infestation was found to be high in school children of Biratnagar. Poor personal hygiene and sanitary condition are supposed to play an important role in establishing intestinal parasitic infections.

Key Words:- Prevalence, Intestinal parasites, Risk factors, School children, Biratnagar.

Introduction:-

Intestinal parasitic infections are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease [1]. These infections are one of the major health problems in several developing countries [2], including Nepal. Rates of the infection prevalence in these countries range from 30-60%, as compared to < 2% in the developed countries [3].

WHO has estimated about 3.5 billion people to be affected with these parasites worldwide, and 450 million people fall ill as a result of these infections, with the majority being children [4]. In 2010, an estimated 819 million people worldwide were infected with *Ascaris lumbricoides*, 464 million with *Trichuris trichura*, and 438 million with hookworm. These infections represented more than 40% of the burden of all the tropical diseases, excluding malaria [5]. Intestinal parasitic infections are among the most common infections, primarily affecting the poorest sectors of the population [5].

Several environmental and socioeconomic factors have been identified to be responsible for the continued persistence of intestinal parasite infections in children [6]. School-age children are the group with the highest prevalence and infection intensities and are also very vulnerable to the effects of worm infection, including

nutritional deficiencies which aggravate malnutrition and worse the rates of anemia and impaired physical and mental development contributing significantly to school absenteeism [7]. About 400 million school-age children around the world are infected with roundworm, whipworm and hookworm [8]. Hence the present study was designed to measure the prevalence of intestinal parasitic infestation and to identify risk factors associated with parasitic infestation among the school children of Biratnagar Submetropolitan.

Methodology:-

A cross-sectional study was conducted from 15th March 2015 to 25th August 2015 in Grade VI, VII and VIII in Government and Private Schools of Biratnagar. To represent children for at least 66.2% intestinal parasitic infection, the sample size was calculated as 200 based on prevalence of 66.2%, 95% confidence level and 10% allowable error. The required sample size was 200 children aged 12-16 years (Agbolade OM et al in 2007) [9]. This research was based on random selection of the study area Biratnagar.

Stratified random sampling method was applied to choose the schools and the study subjects. The strata were Government and private schools of Biratnagar. The schools from its strata were chosen randomly on the basis of Government and private ratio. Out of total 167 schools in Biratnagar Submetropolitan, 65 were government (38.9%) and 102 were private schools (61.1%). Children of Grade VI, VII, and VIII were listed first and required sample was chosen randomly from Grade VI, VII and VIII from selected schools. Out of 200, 38.9 percent (78) were taken from Government schools and 61.1 percent (122) were taken from private schools on the basis of probability proportionate to sample size. Study subjects were enrolled till the required sample size was full filled.

Ethical clearance was taken by Institutional Ethical Review Board of B P Koirala Institute of Health Sciences, Dharan, Nepal. Written permission was taken from each schools head and parents of each student. Written consent was sent through students for approval of parents and then students were brought that written consent after signature of parents. Students of Grade VI, VII and VIII of both sexes and available after three visits was included in the study. Available after three visits means the students was selected randomly on the basis of Roll No. provided by school. Selected students were followed up to three visits and in the case of unavailability next student was taken.

Semi-structured questionnaire was administered to the study subjects and Microscopic Examination of Stool was done. In each visit more than 20 students was enrolled & same number of plastic bottles was given for stool collection and collected next day morning. Microscopic examination of stool was done by preparing slide using Normal Saline and Lugol's Iodine to observe the ova of different intestinal parasites. First we used low power lens and afterwards the high power lens. Then we observed ova of different intestinal parasites [10]. The confidentiality and privacy of the study was maintained; name of the individuals or participating group was not disclose after the study.

The prevalence was calculated, Chi-square test was used to measure the association of risk factors and parasitic infestation. The confidence level was set at 5% in which probability of occurrence by chance is significant if $P< 0.05$ with 95% Confidence Interval.

Results:-

Table 1:- Distribution of parasitic infestation among study population

Intestinal parasites	**Frequency**	**Percent**
Positive	71	35.5
Helminths	31	15.5
Protozoa	40	20.0
Negative	129	64.5
Total	200	100.0
Name of parasites		
Ascaris lumbricoides	11	5.5
Hookworm	13	6.5
Trichuris Trichuria	5	2.5
Hymenolepsis nana	2	1.0
Entamoeba histolytica	15	7.5
Giardia Lamblia	25	12.5

Total	**71**	**35.5**

Table 1 shows more than one-third of the study population (35.5%) were infested with intestinal parasites. Protozoa was seen more among the study population than helminths. Hookworm was seen highest among the Helminth infestation and Giardia lamblia was seen higher than Entamoeba histolytica among protozoans.

Table 2:- Association between sociodemographic characteristics with parasitic infestation

Characteristics	**Parasite Positive**	**Parasite Negative**	**Total**	**P-Value**
School				
Private	39 (32.0)	83 (68.0)	122	0.192
Government	32 (41.0)	46 (59.0)	78	
Gender				
Male	35 (31.5)	76 (68.5)	111	0.190
Female	36 (40.4)	53 (59.6)	89	
Religion				
Hindu	58 (35.8)	104 (64.2)	162	0.854
Others (Muslim, Buddhist, Christian)	13 (34.2)	25 (65.8)	38	
Ethnicity				
Brahmin/Chhetri	31 (35.2)	57 (64.8)	88	0.918
Kirati	4 (30.8)	9 (69.2)	13	
Janajati	14 (40.0)	21 (60.0)	35	
Dalit	7 (41.2)	10 (58.8)	17	
Terai Caste	15 (31.9)	32 (68.1)	47	
Fathers Education				
Illiterate	11 (34.4)	21 (65.6)	32	0.175
Below SLC	50 (39.7)	76 (60.3)	126	
SLC & above SLC	10 (23.8)	32 (76.2)	42	
Mothers Education				
Illiterate	22 (42.3)	30 (57.7)	52	0.146
Below SLC	46 (35.4)	84 (64.6)	130	
SLC & above SLC	3 (16.7)	15 (83.3)	18	
Total	**71 (35.5)**	**129 (64.5)**	**200**	

SLC: School leaving certificate

The prevalence of parasitic infestation was seen higher in female than male but the difference was not significant. The respondents from Dalit were found higher parasite positive than other ethnic groups but the difference was not significant. The parasitic infestation was higher among children whose mother was illiterate than below School leaving certificate (SLC), and SLC pass and above (Table 2).

Table 3:- Association between personal hygiene and food habit with parasitic infestation

Characteristics	**Parasite Positive**	**Parasite Negative**	**Total**	**P-Value**
Source of drinking water at home				
Tap	37 (27.2)	99 (72.8)	136	<0.001
Tube well	34 (53.1)	30 (46.9)	64	
Hand wash before meal				
No wash	27 (32.5)	56 (67.5)	83	0.093
Water only	38 (42.7)	51 (57.3)	89	
Soap	6 (21.4)	22 (78.6)	28	
Bath				
Regular	20 (23.8)	64 (76.2)	84	0.003
Irregular	51 (44.0)	65 (56.0)	116	
Hand wash after defecation				

Soap	55 (32.5)	114 (67.5)	169	0.041
Water	16 (51.6)	15 (48.4)	31	
Sandal wear				
Yes	17 (18.3)	76 (81.7)	93	<0.001
No	54 (50.5)	53 (49.5)	107	
Skin				
Clean	9 (11.7)	68 (88.3)	77	<0.001
Not clean	62 (50.4)	61 (49.6)	123	
Nail				
Cut clean	11 (13.8)	69 (86.2)	80	<0.001
Uncut & Unclean	60 (50.0)	60 (50.0)	120	
Clothes				
Clean	12 (14.8)	69 (85.2)	81	<0.001
Not clean	59 (49.6)	60 (50.4)	119	
Nail Biting				
Yes	44 (57.1)	33 (42.9)	77	<0.001
No	27 (22.0)	96 (78.0)	123	
Thumb Sucking				
Yes	45 (55.6)	36 (44.4)	81	<0.001
No	26 (21.8)	93 (78.2)	119	
Food Habit				
Vegetarian	14 (37.8)	23 (62.2)	37	0.742
Non-Vegetarian	57 (35.0)	106 (65.0)	163	
Total	**71 (35.5)**	**129 (64.5)**	**200**	

Table 3 shows the children using soap and water after defecation had significantly lower prevalence of parasitic infestation than those using only water (P<0.05). The study population who did not wear sandal and shoes showed significantly higher prevalence of parasitic infestation than those wear sandal (P<0.001). The association was also seen among the unhygienic skin, nail and clothes cleanliness and parasitic infestation (P<0.001). The parasitic infestation was seen higher among children having the habit of nail biting and thumb sucking (P<0.001).

Discussion:-

An estimated 3.5 billion people roughly half of the world's population have intestinal parasitoses, which cause almost 450 million deaths every year. The problem is particularly serious in endemic areas with poor sanitation, but parasitic infections are also becoming more common in non-endemic areas as a result of intensified immigration and travel [11].

The prevalence of parasitic infection was higher (35.5%) in our study compared to the studies in Turkey (22.4%), Saudi Arabia (24.4%), Gaza (27.6%), Tehran (18.4%) and in Cambodia (25.7%) [12]. Similar studies done by Kunwor et al in Pokhara, Nepal showed the prevalence of parasites in school going children (17.3%) [13] and Chandrashekhar et al in Kaski district, Nepal (21.3%) [14] which was also lower than our study. Studies conducted in Chitwan, Nepal showed prevalence of intestinal parasites in school going children (44%) [15], Sherchand et al in Kathmandu valley, Nepal (51.9%) [16], Sherchand et al in rural areas of Southern Nepal (65%) [17] which was higher than our study. It was notably high in studies conducted in Thailand (68.1%) and Nepal (71.2%) [18,19]. This concludes that the differences in geographical setting, socioeconomic conditions, cultural practices, awareness programmes and the supply of drinking water can bring vast differences in the prevalence of parasitic infections in different parts of the world.

This study showed the prevalence of parasitic infection was higher in girls than in boys but the difference was not significant. A similar study conducted by Khadka et al in pokhara, Nepal showed the prevalence of parasitic infection was also higher in girls than in boys [20]. Though, females showed a marginally higher prevalence (30%) compared with males (25.7%), there was no significant difference (p>0.05) between the enteric parasitosis and sex [21]. But a study conducted by Wani et al in Jammu and Kashmir State, India where males were more likely to be infected (78.07%) than females (70.16%) [22]. Some studies from Nepal also showed infection rate in boys

marginally higher compared with girls [18,23]. This indicated that the association of gender with parasitic infection differs from one community to another and might be attributed to the socio-behavioral activities.

Prevalence of parasitic infestation in Dalit was higher than other ethnic groups but the difference was not significant. A study conducted by Khadka et al in Pokhara, Nepal also showed highest intestinal parasitic infection in Dalit students [20]. Similar result was obtained in study done from a remote hilly village of western Nepal in which prevalence of intestinal parasitic infection was 71.4% in the lower economic class people. Dalits comprised the majority [24]. This can be attributed to their inaccessibility to safe drinking water, unhygienic personal habits due to lack of knowledge and awareness. This may be due to the difference in human development index (HDI) between Dalits and other ethnic groups [25].

The parasitic infestation was higher in children whose mothers' was illiterate (42.3%) than below SLC (35.4%), and SLC and above (16.7%) but the difference was not significant. Similar finding was also observed from a study from Turkey [26]. Studies conducted by Bisht et al in India [27] and Celiksöz et al in Turkey [28] also showed higher prevalence of parasitic infections whose mothers were uneducated than educated mother. The finding of studies showed that there was an inverse relationship between mother's education and prevalence of parasitic infections. This result agreed with report in a western city sample-Turkey that the prevalence of intestinal parasites was higher in groups where the mother had less than a primary school education [29].

This study showed that the children washing hand with soap and water after defecation had significantly lower prevalence of parasitic infestation (32.5%) when compared with washing hand only using water (51.6%). A study conducted by Rangaiahagari et al in Andhra Pradesh, India in which no hand wash with soap after toilets was found to be a significant risk factor [30]. Non-hygienic living conditions give rise to parasitic infections in children. On the other hand, personal hygiene like hand washing and environmental sanitation are a key determinants for the prevention of intestinal parasitic infections [30].

Regular wearing of sandal or shoes had a significantly lower prevalence of parasitic infections (18.3%) than those did not wear sandal or shoes (50.5%). Intestinal parasitic infection is acquired through contact with contaminated soil and most of the time bare footed individuals are at high risk of infection [31]. However, the study conducted by Getnet et al in Northwest Ethiopia in 2015 showed parasitic infection was not significantly associated with bare footed children [32]. The result obtained in Babile school children that difference in Intestinal parasitic infection without shoes was also not statistically significant [21].

Positive parasites among school children having clean nail (13.8%) was significantly lower than children with not clean (50%). A study conducted by Sah et al in Dharan, Nepal in 2014 also showed significantly lower prevalence of parasites among school children having clean nail (18.8%) than children with not clean (27.5%) [33]. Similar findings was observed in the study conducted by Wani et al in Gurez Valley of Jammu and Kashmir State, India which showed positive rates of parasites among clean nail (58.03%) significantly lower than not clean nail (83.33%) [22]. But another study conducted by Tadesse et al in Ethiopia showed positive parasites among clean nail (25.4%) was not significantly different as compared to not clean nail (28%) [34].

Prevalence of parasitic infestation among having the habit of nail biting was significantly higher (57.1%) than not having the habit of nail biting (22%). Similar study conducted by Sah et al in Itahari, Eastern Region of Nepal in 2013 also showed significantly higher Prevalence of parasitic infestation among having the habit of nail biting (56.5%) than not having the habit of nail biting (18.3%) [35]. Another study conducted by Sah et al in Dharan, Nepal also showed similar trend where prevalence of parasitic infestation among having the habit of nail biting was higher (13.6%) than not having the habit of nail biting (10.7%) [36].

In this study the prevalence of intestinal parasite is found higher among vegetarian (37.8%) than non-vegetarian (35%) but the finding was not significant. A similar study conducted by Rai et al in Nepal also showed vegetarians had higher parasitic infection rate as compared to their non-vegetarian counter parts. Consumption of unwashed fruits and vegetables appeared to be the source of infection among the vegetarians [37].

One limitation of this study was that the sample size was not very large and we could cover only two schools. A larger sample from more schools is necessary before generalizing the results to the whole population. Another

limitation of the study was that we did not perform the direct stool examination or collect swabs from children with perianal itching, which may have resulted in some underreporting of parasites.

Conclusion:-

The overall prevalence of intestinal parasitic infestation was high among school children of Biratnagar. Hookworm was seen highest among the Helminth infestation and Giardia lamblia was seen higher than Entamoeba histolytica among protozoans. Risk factors like irregular bath, not using soap after defecation, not wearing sandals, unhygienic skin, nail and clothes cleanliness, habit of nail biting and thumb sucking were found to be significant relationship in the causation of intestinal parasitic infestation. This advocates the use of various deworming schedule periodically in school to cure the children and to break the transmission chain of these intestinal parasitic illnesses along with Health education regarding hygienic practices in the school at primary levels can have substantial effect in prevention of intestinal parasites among the children.

Acknowledgment:-

We are grateful to B.P. Koirala Institute of Health Sciences for providing grant for the research in 2015. Our gratitude and sincerely thanks to all the participants of study from Schools of Biratnagar and teachers for their kind co‐operation.

Conflict of Interest: No conflict of interest
Funding: B.P. Koirala Institute of Health Sciences, Dharan, Nepal

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