Prevalence and Factors Associated with Intestinal Parasitic Infections among School Children in Sauka and Non-Sauka Communities of Darchula, Nepal

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ABSTRACT

Objectives: To determine the prevalence of intestinal parasitic infections among the school children of Sauka and non Sauka communities of Khalanga, Darchula, Sudurpaschim Province, Nepal.

Methods: This was a cross-sectional study conducted among school children from *Sauka* and non *Sauka* communities in Darchula district of Nepal. Stool samples were processed by using formal-ether sedimentation technique followed by normal saline and Iodine wet mount methods. Identification of parasites and/or ova in the stool samples was performed by microscopy.

Results: The overall prevalence of parasitic infection was 21.3% (74/348), with significantly higher in males (28.3%) than females (16.3%) (p = 0.01). Sauka children exhibited a significantly higher prevalence (26%) of parasitic infection compared to non Sauka (14.9%) (p = 0.02). Lack of toilet at home, occupation, hand washing habits, and anti-helminthic drug use were significantly associated with infection. Monoparasitism (17.8%) dominated over multi parasitism (3.4%), with protozoan (21.6%) more prevalent than helminthes (3.2%). *Giardia lamblia* (9.2%) and *Trichuris trichiura* (1.4%) were the most prevalent protozoan and helminthic parasites, respectively.

Conclusions: High prevalence of parasitic infection in the Sauka community indicates poor health hygiene and socio-economic status. It is high time to implement effective programs including awareness, anti-parasitic drugs distribution, and sanitation and hygiene improvement in this remote community.

Keywords: Intestinal Parasitic Infection, sanitation and hygiene practice, school children, Sauka, non-Sauka community, Darchula, Nepal

INTRODUCTION

Intestinal parasitic infections are one of the major health problems in several developing countries including Nepal (WHO 2000). Intestinal parasitosis appears as one of the significant economic burdens in the developing countries

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(Daryani et al. 2012). Parasitic infections are distributed throughout the world with higher prevalence in low socio-economic communities. Amoebiasis, ascariasis, trichuriasis and hookworm infections are the most common infections all over the world (Norhayati et al. 2003). Parasitic infections more commonly occur in children which leads to cause of anaemia, growth retardation and other physical and mental health problems (WHO, 1998).

In Nepal, about 70% of health problems are due to infectious diseases and diarrheal disease is one of the major causes of morbidity and mortality (Bista 2001). Children are more commonly infected than adults where malnutrition plays a key role among children in Nepal (Agrawal et al. 2012). Children (< 5 years) are most likely to have malnutrition and subsequent parasitic infections. Some of the common intestinal parasitic infection in Nepal includes giardiasis, amoebiasis, ascariasis, ancylostomiasis and taeniasis (Pradhan et al. 2014; Oli et al. 2022). . Previous reports emphasized on the need of further studies on intestinal parasitosis in various rural areas of Nepal where open defecation, lack of education, public awareness and safe drinking water are very common amidst notable poverty levels (Shrestha et al. 2007).

Despite the increasing number of published reports on intestinal parasitic infections, there is a lack of data from some unique populations/ communities like Sauka from the remote areas of far-western Nepal. Sauka community is one of the unique ethnic communities only found in Darchula district of far-western Nepal with specific seasonal migration culture. Therefore, it was very important from the public health perspective to understand pattern of the parasitic infections and associated factors in this unique Sauka population.

METHODS

Study design and setting

A cross-sectional study was conducted from January to June 2024 among the school going children from *Sauka* and non *Sauka* community in Darchula district of Sudurpaschim Province, Nepal. Darchula district borders with two countries (China and India) (Figure 1).

Study population and community context

Sauka ethnic group is found only in Drchula district and they were descended from the Hermit Byashi. They have their own language known as Sauka language, distinct culture and festivals such as Animist and Ghabala religion. The main occupation of Sauka community is animal husbandry i.e. sheep and yak rearing. They migrate to Khalanga (district headquarter) during winter season due to severe cold and return to their native land in the summer to escape the high temperature. Moreover, their hygiene practice is often compromised due to seasonal migration, socio-economic gap and unique activities. Open defecation still remains prevalent in the majority of areas dominated by the Sauka community.

Study participant enrollment and specimen collection

Prior to reaching out to the target school children of this unique community, community approval was obtained from the Ward chair, Sauka leader and school teacher. Before sample collection students in class were given brief description about the importance of examination of stool and impact of intestinal parasites on human health. After obtaining the informed consent/ assent for each participant, they were enrolled in the study. A structured questionnaire was administered to collect data on age, sex, family size, clinical history, and hygienic practices. A pre-labeled clean, dry, wide mouthed and screw capped plastic container (20 ml capacity) was given to each student and instructed not to contaminate stool with water and urine.

A total of 400 plastic containers were distributed among students and they were instructed to bring about half container of the stool sample next day, however only 348 students provided the samples.

Specimen storage, shipping and laboratory analysis

The collected samples were fixed with 10% formal saline and brought to Kathmandu for further processing. Laboratory examination of the stool samples was carried out at Shi-Gan International College of Science and Technology Laboratory in Kathmandu, Nepal.

Microscopic examination was done for the detection and identification of protozoal cyst, helminthic eggs and larva. Microscopy was done by saline and iodine wet mount preparation method. The slides were observed under low power (10x) followed by high power (40x) objective using a light microscope. Parasite cysts, and eggs of helminths were identified by their morphology.

Samples were concentrated by centrifugation before performing wet mount. This process concentrated eggs, larva and cysts to increase the sensitivity of microscopic examination when they present in low. Formal-ether sedimentation technique was used for concentration.

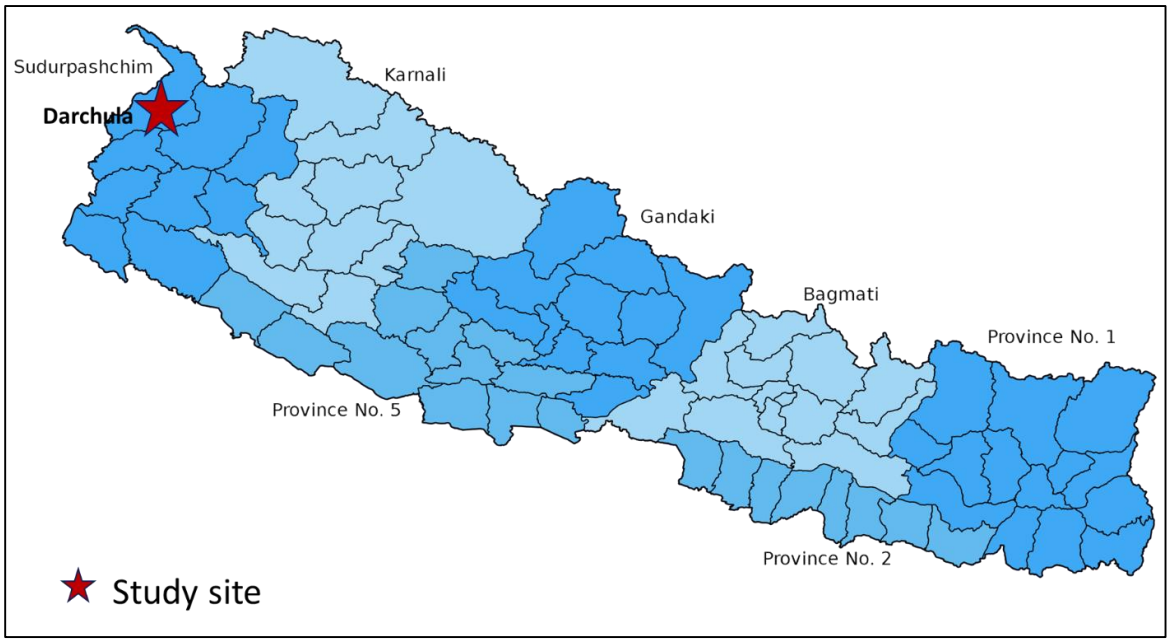

Figure 1: Map of Nepal showing the geographical location of the study site (Khalanga, Darchula district of Sudurpashchim Province)

Data analysis

After laboratory processing of the samples, the results obtained were recorded in a log book and later transcribed in the computer. Data were verified, validated and analysed by using SPSS version 21. Chi-square test was used the determine the statistical significance and $p<0.05$ was considered significant.

RESULTS

General profile of study participants

A total of 348 school going children from class nursery to class ten (145 males and 203 females) were included in this research study. Out of total 348 children included in the study, the overall prevalence rate of parasitic infection was 21.3% (n=74) and were infected by single or multiple intestinal parasites.

Factor associated with parasitic infections

The intestinal parasitic infection among school children of *Sauka* and non *Sauka* community of Khalanga in Darchula district was closely related with socio-economic condition, health hygiene, sanitary condition and level of education ($p<0.05$).

Children from *Sauka* community were more prone to parasitic infection as compared to non *Sauka* community ($p=0.04$). The prevalence of parasitic infection was significantly higher in male compared to female. The prevalence was higher in the age group 6-10 years as compared to age group ≤ 5 years and >10 years ($p=0.01$). The infection rate was significantly higher among children who had not taken the anti-helminthic drug as compared to the children who had taken the drug before six months. Prevalence of parasitic infection was higher in children who did not have toilet at home (36.7%) as compared to children who had it (19.8%) ($p=0.03$).

Moreover, prevalence of parasitic infection was found to be higher (27.8%), 25.7% and 15.0% in children of farmer, army/police and other profession, respectively ($p=0.03$). Furthermore. children who washed their hands before meal had the lower rate of parasitic infection (19.7%) in comparison to the children who did not wash their hands (33.3%) though statistically insignificant ($p=0.13$) (Table 1).

Etiology of parasitic infections

The protozoan parasites were dominant (21.2%) over helminthes (3.4%). G. lamblia (9.2%) and T. trichiura (1.4%) had the highest prevalence rate among protozoan and helminthes followed by A. lumbricoides and H. nana (0.9%) and E. vermicularis (0.3%), respectively.

Furthermore, single parasites were detected from 62 children (17.8%) whilw multiple parasites were detected from 12 children participants (3.4%) (Table 2).

Table 1: Distribution of parasites infection in different characteristics among Sauka and non Sauka community, Darchula, Nepal

Variables	Category	Total	Positive	P value
	Sauka	200	52 (26%)	0.04*
	Non Sauka	148	22 (14.9%)	
Sex	Male	145	41 (28.3%)	0.01*
	Female	203	33 (16.3%)	
Age	≤5	27	5 (18.5%)	0.02*
	6-10	192	45 (23.4%)	
	>10	129	24 (18.6%)	
Education level	Pre-primary	72	11 (15.3%)	0.55
	Primary	207	51 (24.6%)	
	Secondary	69	12 (17.4%)	
Family Size	≤4	93	14 (15%)	0.17
	>4	255	60 (23.5%)	
Occupation	Agriculture	108	30 (27.8%)	0.03*
	Police/Army	74	19 (25.7%)	
	Others	166	25 (21.3%)	
Anti-helminthic drug	Yes	212	37 (17.5%)	0.03*
	No	136	37 (27.2%)	
Hand wash before meal	Yes	309	61 (19.7%)	0.13
	No	39	13 (33.3%)	
Nail trimming habit	Yes	326	66 (20.3%)	0.01*
	No	22	8 (36.4%)	

*$p < 0.05$ was considered statistically significant.

Table 2: Etiology of parasitic infections among Sauka and non Sauka Community, Darchula, Nepal

Parasites	Number of positive samples (n)	Proportion of infection (%)
G. lamblia	32	9.2
E. coli	25	7.2
E. histolytica	17	4.9
T. trichiura	5	1.4
A. lumbricoides	3	0.9
H. nana	3	0.9
E. vermicularis	1	0.3

DISCUSSION

Intestinal parasitic infection is a common public health problem in developing countries including Nepal. In Nepal, the prevalence of intestinal parasitic infection is higher and varies significantly from one study to another (Oli et al. 2022; Khadka et al. 2013; Shrestha *2002*, Rai et al. *2004*; Malla et al. 2004). The findings of this study showed the overall prevalence of intestinal parasites as high as 21.3% among the school children of Darchula district. Among the parasites identified, *G. lamblia* was the most prevalent, infecting nearly 9.2% of the total participants followed by *E. coli* and *E. histolytica* (7.2% and 4.9%). The prevalence rate of helminthes is found less than that of protozoan parasites.

Interestingly, the prevalence of parasitic infection was significantly higher in *Sauka* community compared to non *Sauka* community (p=0,04). The elevated higher prevalence of parasitic infections among the Sauka community might be due to their poorer socio-economic conditions with poor personal hygiene practices, lack of awareness of health education and their peculiar cultural activities (Khadka et al. 2013; Khadka et al. 2022; Subedi JR et al.2021). The study highlights the poor health status of school children in the economically disadvantaged farming community of Darchula. Although some improvements in socio-economic conditions, access to clean water, and household toilets are noted, addressing intestinal parasitosis requires more than drug distribution. Human behavior, cultural practices, natural events, and political factors may contribute to the ongoing high parasite prevalence in this community.

The parasitic infection rate was higher in male (28.3%) than female (16.3%*)* (p=0.01). The findings agreed with the previous reports from Nepal (Regmi et al *2014*; Shrestha et al *2012*; Khanal et al. *2011*; Pradhan et al. *2014*). In contrast to previous findings indicating that equal opportunity to acquire infection in both males and females, suggesting gender independence in parasitic infections (Tandukar et al, 2013; Oli, 2016; Khadka et al. 2013). Higher prevalence was observed in the 6-10 age group, which is consistent with the findings of Joshi et al. (2005). This may be due to underdeveloped immunity and increased outdoor play in dust. Prevalence is lower in >10 years and <5 years, possibly due to stronger immune systems and enhanced parental care, respectively (Khanal et al. 2011; Thapa Magar et al. 2011). However, we do not have data to confirm it.

The positive rate of parasitic infection was higher among children who did not use toilet in comparison to toilet users (P<0.005) (Table 1). This is particularly notable in Sauka community where open defecation is still very common. *The finding is also supported by a previous report by* Daryani et al (2013). Open defecation may contaminate the nearby water sources and drinking such contaminated water without boiling may cause parasitosis. The feces may also reach to vegetable garden and if such vegetables are consumed without proper cooking or eaten raw, there is higher chances of getting infection. Moreover, children who regularly trim their nails have a lower parasite infection rate, while those not doing so may have parasite cysts or eggs sticking inside the nails, and subsequently entering into the body during food consumption. Hygiene level is the key in parasitic infection among children (Pradhan et al. 2014).

Prevalence of parasite was comparatively higher in the children of the parents involved in low income occupation like farming, lower rank of army and police, carpenter as compared to the parents involved in high income occupation like officers, teachers and businessmen. The higher income is directly related with nutrition, hygiene and access to health facility. People with low income cannot manage proper balanced diet, cannot afford pure drinking water and better level of education, and thus have more chances to get infected with parasites.

Moreover, children who did not take anti-helminthic drugs showed a significantly higher parasite prevalence of 27.2% compared to those who received the treatment (17.5%) (P=0.02). The effectiveness of the anti-helminthic drug likely contributed to the lower prevalence in the treated group since the campaigns by government and non-government sectors contributed in this decline. Unfortunately, there is still a bigger proportion in the community not receiving and noncompliance to such anti-helminthic drug. Despite the efforts to improve health services by government and different non-governmental organisations, adequate progress has not been observed. Therefore, more productive efforts from government and non-goverment organisations is required to reduce the problems of intentinal parasitosis in the Sauka community as well as the remote communities.

Conclusion

High prevalence of parasitic infection in the Sauka community indicates poor health hygiene and socio-

economic status. It is high time to implement effective programs including awareness, anti-parasitic drugs distribution, and sanitation and hygiene improvement in this remote community.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

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