Helminth Infections in an Indigenous Community of Nepal: The Role of Individual and Household Socio-Economic Factors

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Abstract

Background and Objective: In Nepal, gastrointestinal helminthiases are endemic in indigenous people living in low laying areas of the country. However, little is known regarding the role of different socio-economic indicators on helminth infections in these communities. The main aim of this study is to identify the relationship between socio-economic factors and helminth infection in an indigenous community in Nepal.Method: A cross sectional survey was conducted in the Gaindakot Village Development committee, Nepal in July to August 2010. Total of 137 people of 10-60 years of age provided faecal samples for parasitology and answered a questionnaire on indicators of their socio-economic conditions.Result: Overall 54.0

Index terms— Helminth infection, Socio-economic factors, Indigenous population, Nepal.

1 Introduction

nfections caused by gastrointestinal helminths are one of the most common health problems for poor people and are important causes of anaemia, malnutrition which may result in reduced physical and Indigenous population covers 38.8% of total population of Nepal. Majority of them live in extreme poverty and deprived socioeconomic conditions of landlessness. As a result, they are unable to access primary health care, basic education and safe drinking water [9,10]. They often share their house with domesticated animals such as goat, pig, poultry, cow and buffalo. Access to sanitation is also nonexistent and waste disposal is often done at the bank of water course or at the edge of the forest [11,12].

Gastrointestinal helminth infections rank fourth in the top ten infectious diseases in Nepal with 100% prevalence in some indigenous communities [12]. There had been very few studies conducted the epidemiology of helminth infections in Nepal [13][14][15]. These studies had shown the prevalence rate of helminth infection in different communities. However, there has not been a single study to date looked at the relationship between socio-economical condition and helminth infection in indigenous communities of Nepal. In this study, we aimed to quantify the role of individual and household socioeconomic indicators in helminth infection of indigenous population of Nepal. Studying these effects is important as these are modifiable factors and could improve the effect of helminth infection if acted upon. Keywords : Helminth infection, Socio-economic factors, Indigenous population, Nepal. mental development [1,2]. It is estimated that almost half of the worlds' population is infected by parasitic helminths at some point of their life [3]. Helminths infections are endemic in tropical and subtropical regions of the world [4] such as Nepal due to the warm and moist climate which is favourable for helminths. Socio-economic conditions can influence the social behaviour of individual with respect to access to primary health, primary education, improve sanitation and safe water, an important contributor of helminths infections [5,6]. Helminths Infestations rate could increase into the individuals with lack of health education, poor sanitation, lack of safe water supply, primary health, household hygiene and personal behaviour [7,8].

was disclosed to all individuals (male, female and children) in their language. Written consent was obtained from all individuals participating in the study. In Indigenous people of the study area have limited excess to the health service, education and safe drinking water due to the higher cost of those services in Nepal [6]. Health care

practices of these communities depend upon native plants and traditional healers known as Dhami and Jhakri who perform ancient rite of protection, blessing and healing [16].

2 c) Data Collection

A community based cross-sectional parasitological survey was conducted in July to August 2010. Individual and household socio-economic data such as occupation, sanitation, water source, house type and sharing house with animals were collected by mean of questionnaire. Each socio-economical variable divided in groups such as, occupation was divided in to professional (office worker), student and laborer (agriculture and construction). Similarly, sanitation was divided in to permanent, temporary and open field. Water source was divided in to pipped and open water (river, pond, lake), house type was divided in to concreted (cement and brick) and mudded (bamboo and mud), house sharing with domestic animals was divided in yes (in same house) and no (in different house). One house one individual system was applied for the study. The questionnaires were administered after consent to obtain faecal sample was signed by the individual. Labelled sterile sample vials were handed to the individual with clear instructions on how to collect consent was signed by a parent or a caregiver on their behalf. the sample. Faecal samples were collected early next morning by the research team member. The collected samples were then transported to the laboratory of Institute of Agriculture and Animal Science, Chitwan, Nepal. Magnesium floatation method [17] was applied to extract helminths eggs from samples and microscopic observation was conducted. All the results from microscopy and questionnaires were stored into a Microsoft Excel spreadsheet.

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4 d) Statistical Analysis

were developed. Univariate logistic regression models for a Bernoulli-distributed outcome and cluster correction by neighborhood using robust standard errors were built to screen variables for inclusion in the final multivariable model.

5 III.

Result a) Data for Analysis A total of 137 faecal samples were collected from female (n=70) and male (n=67) of different (10-60 years) age group and occupations. Occupation wise more than half (54.1%) study people were worked as a labourer; only 18.2% people were worked in office environment. Similarly, 50.4% people disposed their excreta in open fields near the river or edge of forest, 65.7% people did not have access to piped water and used open water source for everyday purpose. Furthermore, 84.7% people live in the mudded house and 56.2% share their house with domestic animals (Table 1). Existence of helminths eggs in stool was used as the outcome variable thus all subjects were categorized into infected and not infected based on the presence of at least one parasitic helminths egg. A chi square test was conducted to test the statistical significant within the socio-economic variables. A student t-test was performed to determine the significant difference between male and female population. Pearson correlation test was conducted to establish the relationship between socio-economical variables with helminths infection rate. Multivariable statistical models b) Role of individual and household socioeconomic factors

Overall, the helminth infection rate was very high (54.0%) in the community. Lack of education had significantly increased the helminth infection rate in the study population. People worked as a labourer had the highest (74.3%) rate of helminth infection followed by people worked in the office environment (32.0%) and students (28.9%). The result was found to be statistically significant ($P < 0.05$). Similarly, improve sanitation and water supply had played crucial role on helminth infection in the community. The infection rate was greater (69.6%) in the group of people used open field as a night soil disposal place than group of people who had temporary (43.6%) and permanent (31.0%) sanitation in place. The result was found to be statistically significant ($P < 0.05$). People used an open source of water for daily purposed had higher (57.8%) infection rate than pipped water user (46.8%) however the result was not found to be statistically significant ($P > 0.05$). Similarly, household hygiene, mudded house and sharing the house with domesticated animals had proven to be favorable for helminth infection in the study area. The mudded house dwellers had higher (56.9%) infection rate than the people lives in a concreted house (38.1%) but the result was not found to be statistically The multivariable models of hookworm and roundworm infection also show that occupation was also significantly associated with hookworm and roundworm infection. While in the hookworm model students were at more risk of infection compared to professionals. In the roundworm model those with laborer were at increased risk of infection compared to professionals ($P=0.001$). The results also showed that water source and sanitation were associated with increased risk of hookworm infection; an association was significant for sanitation ($P<0.05$). Interestingly, hookworm infections were marginally more likely in areas closer to the river and roundworm were significantly more likely to be associated with lower altitudes ($P = 0.005$) (Table 2). domesticated animals had increased rate (63.6%) of helminth infection than those who did not share their house with domesticated animals (41.7%) and the results were statistically significant ($P < 0.05$) (Table 1).

Overall, the infection rate was found to be higher (58.6%) in female population in comparison to (49.3%) their male counterpart. The male dominant society had influenced the infection rate one way or another. In every aspects of socio-economical variables, females had higher infection than male (Figure 2). However, the results were not statistically significant. infection in communities [5,18]. Majority of the indigenous people could not afford proper education due to the increasing cost of living in Nepal. Most of their income spent on daily needs. Working in agricultural farm, and construction is become their livelihood which increased the risk of exposing themselves with helminth contaminated soil and water [19]. The more exposure in the contamination had directed them to the higher infection rate. Due to lack of health education, people become unaware of epidemiology of helminth parasites and personal hygiene that could elevate the infection in the community people. Asaolu and Ofoezie (2003) mentioned that the health education can be used as a strong tool for reducing helminth infection and helps changing individual behaviour.

6 IV.

7 Discussion

Access to improve water, sanitation facilities and personal hygiene has long been known as important contributing factors for parasitic helminth Disposing night soil on the open field means harvesting the helminth parasites because soil is good habitat for the helminths to remain viable for long period of time [13]. Inadequate sanitation increases the chance of contamination and increases the risk of helminth infection [21]. Weather events such as rainfall can wash off parasitic eggs from soil to waterways and increase The study demonstrated that the type of water source used by people had played an important role in helminth infection. The helminth infection was higher in those with open water sources compared to those with piped. Affordability of safe drinking water through piped infrastructures was very minimal in the study area. People used river where they disposed night soil or in underground ponds as a source of water without realizing the contamination on them. Laundering and swimming in the river is almost tradition among the study people. However, some of the study population had access of piped water, those water were collected from creeks, up on the hill and never been tested for contamination. The tradition of disposing night soil at the bank of river and edge of the forest could contaminate the pipped water source as well. The people who used open water source have higher infection because they spent more time in river and pond and expose themselves to the helminths parasites. However, the cost of pipped water forced them to find alternative water source. As a result pipped water user also visit to the river for swim and laundry purpose and ultimately victimized themself to helminth infection. Previous independent studies [22,23] suggested time of exposure and concentration of contamination eventually increased the risk of helminth infections. the risk of infection through water in the community. In addition, people without sanitation had to visit open place regularly to dispose the night soil could increase the chance of contaminating helminth parasites into them. That would indicate the higher infection rate in the study people who did not have proper sanitation.

People living in a mudded house and sharing with domestic animals were more likely to have helminth infection than people lived in a concreted house. It could be the result of frequent maintenance required for mudded house than concreted house. Large volume of water and soil would require maintaining a house. Using contaminated water and soil to build and maintain the house is almost harvesting parasites in the house because helminth parasites remain viable for long time in soil [13]. By doing so, people could increase the risk of helminth infection. Sharing a house with domesticated animals is a good indicator of the poverty and poor hygienic condition of the household. Our results showed that sharing accommodation with domesticated animals were at increased risk of helminth infection. Domestic animals such as pig, poultry frequently visit to the night soil disposed area for food and can carry infective ova or larvae into the house [24] that increases the chances of exposure to parasites. Similarly, goats, cows and buffalos like to graze in the heavily grassed area. Night soils have high organic fertiliser which helps grass to [25]-by grazing heavily grassed area those animals (cow, goat) can easily bring parasites to house and infect people [26].

This indigenous community was a male dominant community. Females are the most disadvantage group of member in the family, they are forced to leave school, marriage in early age and involved in household work such as cooking, cleaning, washing, laundering as well as worked as an agricultural laborer in spare time. A mudded house required regular swiping increased the risk of infection and laundering, cooking and cleaning require frequent exposed to the contaminated water for long time. This traditional custom had led increased risk of helminth infection in women. Previous studies showed that indigenous women also go to the river for laundry and in doing so they increase the chances of being exposed to parasites eggs [22,27]. That could be the consequence of female having higher infection rate than male in all socioeconomical aspects.

Multivariable model also suggested that students (in case of hookworm) and professionals (in case of roundworm) had less risk of infection than illiterate people who worked as agriculture and construction labourer. These findings suggest that occupational exposure may be an important driver of roundworm epidemiology in this indigenous population of Nepal. These findings may also be an indirect indicator of the level of education in the population regarding roundworm and hookworm infection which has been reported to play a vital role in reducing helminth infections [5,28].

The model showed that hookworm infection had elevated with the poor sanitary condition and marginally high with water source than other infection. This might be the case of the mode of transmission of the hookworm.

Hookworm can easily transmit through the skin as well as oral ingestion but other parasites only transmit through oral ingestion [1]. This model showed that hookworm infection was marginally associated with the proximity to the river but roundworm infection was significantly associated with altitude. Based on our results hookworm infection was common closer to the V.

8 Conclusion

Helminth infections, particularly hookworm and roundworm are endemic in this indigenous population of Nepal and socio-economic conditions play an important role in helminth infections in this community. In addition, improve sanitation, improve drinking water, education can help to fight against the helminth infections. The effect of individual and household socioeconomic indicators remarkably differs between hookworm and roundworm infection. Household variables as well as individual level variables are good predictors of hookworm infection. In case of roundworm, individual level variables related to the public domain such as occupation (and possibly hygiene behavior) constitutes better predictors. Further studies are required to understand the best combination of water, sanitation and hygiene/health promotion interventions for the effective control of helminth infections in this population with important repercussion for the control of helminth infections in other indigenous communities of Nepal.

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Figure 1: F

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[1] ( )
[2]

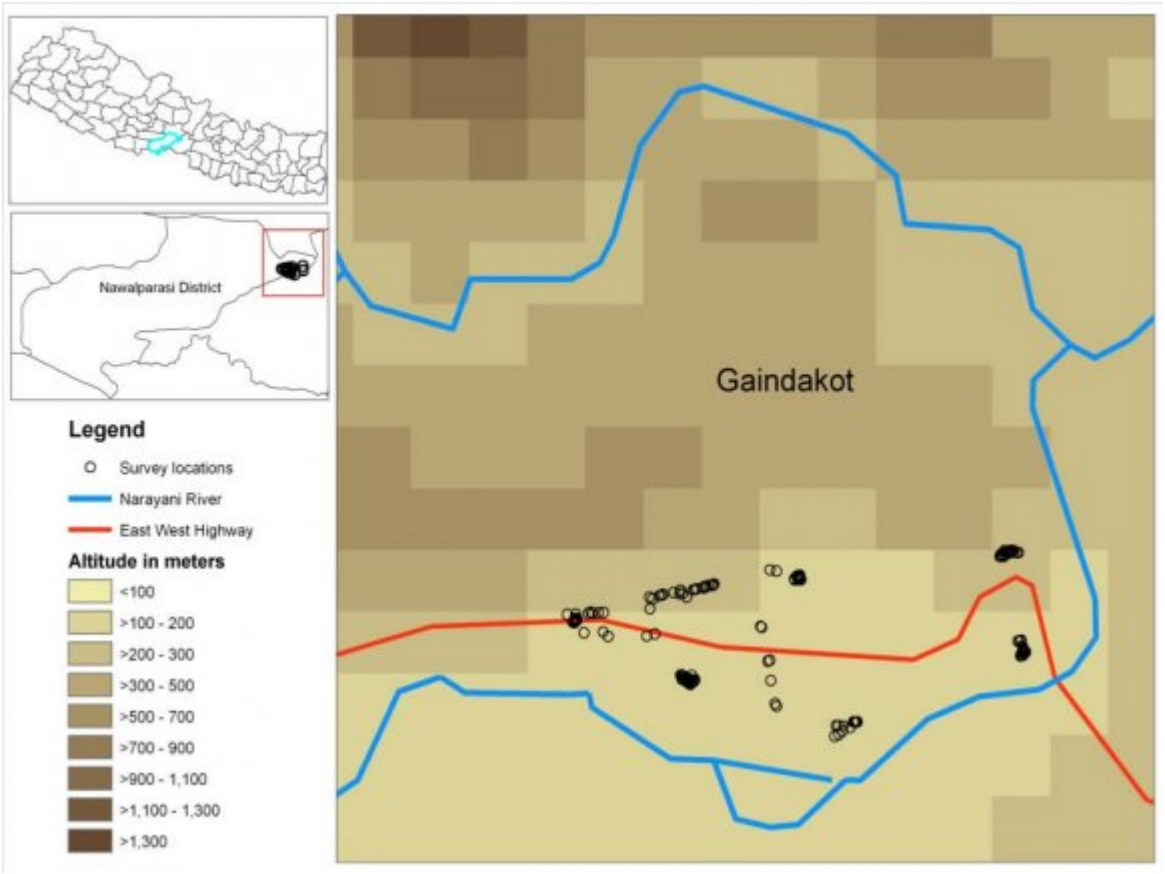
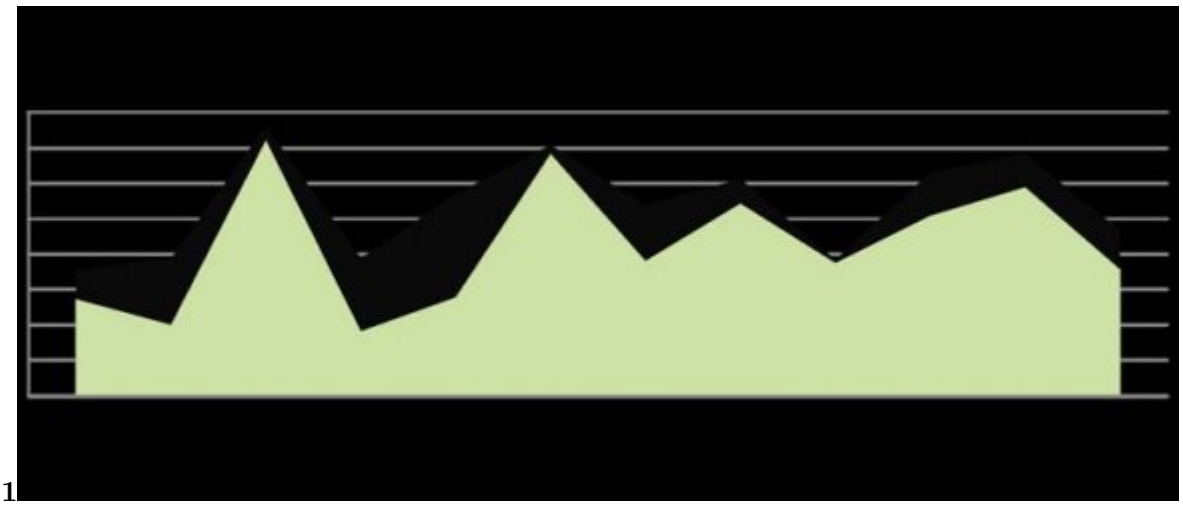


Figure 2:



1

Figure 3: Figure 1 :

1

Socio-economic variabls		Obs (n)	Pos (n)	+ve (%)	P-value r
Occupation	Professional	25	8	32.0	P < 0.05 0.99
	Student	38	11	28.9	
	Labourer	74	55	74.3	
Sanitation	Permanent	29	9	31.0	P < 0.05 0.99
	Temporary	39	17	43.6	
	None	69	48	69.6	
Water source	Pipped	47	22	46.8	P > 0.05 1
	Open source 90		52	57.8	
House type	Concreted	21	8	38.1	P > 0.05 1
	Mudded	116	66	56.9	
House sharing with animals	Yes	77	49	63.6	P < 0.05 1
	No	60	25	41.7	

r = Pearson correlation coefficient

Figure 4: Table 1 :

2

		P-	value		
models of hookworm and roundworm infection	Hookworm Roundworm	P-	Coefficient value Coefficient 95%CI	95%CI	0.71 -0.29 1.71 0.17
: Multivariable			Variable		Labours Vs Professional
	Socio-economical status				Occupation

Figure 5: Table 2

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.2 Conflict of Interest:

The authors declare that there is no conflict of interest.

[Shakya et al. ()] , B Shakya , D Bhargava , S Shrestha , B P Rijal . *Journal of Institute of Medicine* 2009. 31 (3) p. . (Intestinal parasitosis)

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[Ahmed et al. ()] ':242. river bank which may suggest exposure to hookworm larvae at river banks during walking to find night soil disposal spot every day. Furthermore, sandy soil has been shown to be favorable for the development of hookworm infective larvae'. A Ahmed , H M Al-Mekhlafi , S H Choy , I Ithoi , Al Adhroey , A H Abdulsalam , AM . *Parasites & Vectors* 2011. 4. (The burden of moderate-to-heavy soil-transmitted helminth infections among rural malaysian aborigines: an urgent need for an integrated control programme. 24, 29] and therefore the river bank may constitute a suitable environment for)

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