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## Original Research

### A study of prevalence of *Taenia* infestation and associated risk factors among the school children of Itahari Municipality, Eastern region of Nepal

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**Abstract**

**Aim/Background:** *Taenia* infestations are widely prevalent in developing countries like Nepal where pigs are reared and pork is consumed. Lack of sufficient sanitary facilities, illiteracy and poverty are key factors to the completion of the parasite's life cycle. The objective of the study was to measure the prevalence of *taenia* infestation and to identify risk factors associated with *taenia* infestation among the school children of Itahari Municipality.

**Methods:** A cross sectional study was conducted in Eastern Nepal. Total 200 school children from Government and Private schools were taken for this study. Stratified random sampling method was applied to choose the schools and the study subjects. Semi-structured questionnaire was administered and microscopic examination of stool of all study subjects was done. The chi-square test was used to measure the association of risk factors and *taenia* infestation. P-value was set 0.05 for significance.

**Results:** The prevalence of *taenia* species was found to be 6.5 percent. Almost ten percent of female and three percent of male were infected with *taenia* species. The respondents from Dalit were found higher prevalence of *taenia* infestation than other ethnic groups. The use of soap and water after defecation had significantly lower prevalence of *taenia* infestation (3.1%) than only using water (10%). Not a single case of *taenia* infestation was found in the children who used sandal.

**Conclusion:** We conclude that the prevalence of *taenia* infestation was found to be high in school children of Itahari.

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## INTRODUCTION

Taeniasis refers to a human infection caused by the adult tapeworm of *Taenia solium* and *Taenia saginata*. The infective stage of *T. solium* (*Cysticercus cellulosae*) develops in the pig, while that of *T. saginata* (*Cysticercus bovis*) develops in buffalo and cattle. The adult stages of *T. solium* and *T. saginata* are obligatory intestinal parasites for man. The infection frequently occurs in populations living in poor sanitary conditions, and people infected with *T. solium* can

initiate the spread of proglottids into an endemic environment [1].

Pig animal is considered as a reservoir of *Taenia solium*. Particular ethnic groups comprise up to 25% of the population of Nepal, are pig farmers and pork consumers with very low hygienic and sanitation practices, and with no control of pig husbandry and slaughtering [2]. Nepal, especially with people of some ethnic/ religious groups, and food habits are concerned with human taeniasis. Some of the ethnic groups e.g.

Tharu in the plains (*terai*) region and Rai in the hill region keep pigs as their cash crop/property [3].

WHO estimated that 50 million persons, predominantly from developing countries, are infected with taeniasis and 50,000 people die of the disease each year [4]. The infection is also present in India, Pakistan, northern China, Thailand, and Nepal [5]. *Taenia* cysts were observed for the first time in pig meat slaughtered in Kangeswari, Kathmandu, Nepal [6]. Therefore this study was designed to measure the prevalence of taenia infestation and to identify risk factors associated with taenia infestation.

### MATERIALS AND METHODS

The cross sectional study was conducted from 15<sup>th</sup> Nov 2011 to 14<sup>th</sup> March 2012 in Grade VI, VII and VIII in Government and private schools of Itahari Municipality. This research was based on random selection of the study area Itahari Municipality. Stratified random sampling method was applied to choose the schools and the study subjects. The representative sample i.e. 200 was taken for the study on the basis of prevalence of 50%, 95% confidence level and 15% allowable error (Joshi DD et al in 2007)[12]. aged 12-15 years. Out of total 47 schools in Itahari Municipality, 7 were Government (15%) and 40 were private schools (85%). One Government and two private schools were taken. Children who were in

Grade VI, VII, and VIII were listed first and out of 200, 15 percent (30) were taken from Government schools and 85 percent (170) were taken from private schools on the basis of probability proportionate to sample size. Study subjects were taken based on random sampling.

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. Students of Grade VI, VII and VIII of both sexes and who were available after three visits were included in the study.

Semi-structured questionnaire was administered to the study subjects and microscopic examination of stool was done. In each visit more than 20 students were 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 *Taenia species*. First we used low power lens and afterwards the high power lens. Then we observed ova of *taenia species* [7].

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

**Table 1.** Association between socio-demographic characteristics with taenia infestation

Characteristics	Taenia Positive	Total	P-Value
<b>Gender</b>			
Male	3 (2.9%)	103	0.03
Female	10 (10.3%)	97	
<b>Religion</b>			
Hindu	12 (6.6%)	181	0.94
Others (Buddhist, Christian, Muslim)	1 (5.3%)	19	
<b>Ethnicity</b>			
Brahmin/Chhetri	3 (3.7%)	82	0.29
Kirati	4 (13.8%)	29	
Janajati	3 (7.3%)	41	
Dalit	1 (16.7%)	6	
Terai Caste	2 (4.8%)	42	
<b>Fathers Education</b>			
Below SLC	3 (5.9%)	51	0.267
SLC & above	10 (6.7%)	149	
<b>Mothers Education</b>			
Below SLC	8 (6.8%)	118	0.70
SLC & above	5 (6.1%)	82	
<b>Total</b>	13 (6.5%)	200	

SLC-School Leaving Certificate

**Table 2.** Association between personal hygiene and cooking pattern with taenia infestation

Characteristics	Taenia Positive	Total	P-Value
<b>Source of drinking water at home</b>			
Tap	2 (1.6%)	126	<0.001
Tube well	11 (14.9%)	74	
<b>Water treat at home</b>			
Yes	0 (0%)	54	0.02
No	13 (8.9%)	146	
<b>Hand wash before meal</b>			
No wash	10 (12.3%)	81	0.01
Water only	3 (3.4%)	87	
Soap and water	0 (0%)	32	
<b>Bathing</b>			
Regular	1 (0.8%)	120	<0.001
Irregular	12 (15.0%)	80	
<b>Hand wash after defecation</b>			
Soap and water	5 (3.1%)	162	<0.001
Water only	1 (10.0%)	10	
Mud and water	7 (25.0%)	28	
<b>Sandal wear</b>			
Yes	0 (0%)	99	<0.001
No	13 (12.9%)	101	
<b>Habit of nail Biting</b>			
Yes	11 (15.9%)	69	<0.001
No	2 (1.5%)	131	
<b>Habit of thumb Sucking</b>			
Yes	10 (15.4%)	65	<0.001
No	3 (2.2%)	135	
<b>Food habit</b>			
Vegetarian	0 (0%)	25	0.15
Non-vegetarian	13 (7.4%)	175	
<b>If Non-vegetarian</b>			
Pork eating	12 (8.4%)	143	0.08
Non-pork	1 (1.8%)	57	
<b>Cooking duration</b>			
Less than 40 minute	13 (9.4%)	138	0.01
More than 40 minute	0 (0%)	62	
<b>Total</b>	13 (6.5%)	200	

## RESULTS

Among the 200 study population prevalence of taenia species was found 6.5 percent. Almost ten percent of female and three percent of male were infected with taenia species. The respondents from Dalit were found higher prevalence of taenia infestation than other ethnic groups (Table 1).

Not a single case of taenia infestation was found in the children who used soap and water before meal. Prevalence of taenia infestation was significantly lower (3.1%) in the respondents who were use soap and water after defecation than in the respondents who used water only (10%). There was no case of taenia infestation among children wearing sandal (Table 2).

## DISCUSSION

*Taenia solium* and *taenia saginata* species are worldwide in distribution. Infection is found most often in rural areas of developing countries with poor hygiene and living in close contact with pigs and eating undercooked pork/meats, where pigs and cattle are allowed to roam freely and eat human feces. Taeniasis is rare in Muslim countries where eating pork and rearing pigs are not practiced [4].

In this study, taenia species was seen 6.5 percent among the school children of Itahari which is higher than studies conducted by Merid Y in south Ethiopia (0.13%)[8]. and Sah R B et al in Dharan, Nepal (5.5%) [15]. In Itahari, the majority of the Dalit and Kirati ethnic groups, due to their socio-economic and cultural conditions, consumption of pork are very high.

Taenia was observed significantly higher (10.3%) among female than male (2.9%). But a study conducted in Ethiopia showed that *Taenia Saginata* cases was 82% in males, and 18% in female, respectively [9]. This indicated that the gender may or may not play role in parasitosis depending on the region and other environmental or behavioral factors. Generally, the increased mobility of the male increases the risk of infection among them. On the other hand females have more soil contact during growing vegetables and eat raw vegetable or meat with prepared food more often.

In our study, taenia infestation among Hindu was higher (6.6%) than others (Buddhist, Christian and Muslims (5.3%) but the difference is not significant. *Taenia solium* is rare in Indonesia as a whole because of the Islamic taboo on eating pork however, in a number of areas (eg. Papua and Timor) it is a public health problem, as it has previously been in Bali [10,11]. There are certain religious taboos regarding meat consumption, for example, Hindus are not

supposed to eat beef; many Jews and Muslims do not eat pork. Depending upon the availability of the animals and cultural habits, meat consumption is different in different countries and various religious communities [12].

The ethnic group was divided into five categories as Brahmin/Chhetri, Kirati, Janajati, Dalit and Terai Caste. The respondents from Dalit were found higher (16.7%) prevalence of taenia infestation. So, this value shows poor sanitation and water contamination and low socio-economic status affects in parasitic infestation and correlate with previous study. Dalits in Nepal have a relatively low literacy rate, unhygienic habits and low socio-economic status [13]. Similar kind of study done by Joshi DD et al in Nepal about Taeniasis infections related to the ethnic groups surveyed and their food habits, literacy rates, and hygiene and sanitation. The prevalence of taeniasis among the ethnic groups surveyed, i.e. Magars, Sarkies, Darai and Bote, was found to be 50%, 28%, 10%, and 30 %, respectively. Magar people are known for rearing pigs and eating much more pork than other ethnic groups, while the Sarkies are the poorest of the ethnic groups and are known to consume rotting cattle carcasses [12].

Many researchers have established that age, socio-economic and behavioral factors play a definitive role in causing intestinal geohelminth infection. Characteristics like religion, use of footwear when outdoors, defecation practices, cattle ownership and water sources have implications in spreading infection [14].

In this study, taenia infestation among regular bathing was significantly lower (0.8%) than irregular bathing (15%). Similar study conducted by Sah RB et al in Dharan municipality, Nepal showed taenia infestation among regular bathing was lower (5.1%) than irregular bathing (8%) but the difference was not significant [15].

Only non-vegetarian group (7.4%) was found taenia positive. Similar study conducted by Sah RB et al in Dharan municipality, Nepal which showed that taenia infestation among non-vegetarian children was slightly higher (5.6%) than vegetarian (4.7%). In this study the prevalence of taenia infestation was found higher (8.4%) among pork eating than non-pork eating population (1.8%). Similar study also showed higher prevalence of taenia infestation (6.5%) among pork eating than non-pork eating (4.7%). No significant relationship was established in these factors [15].

The review of taeniasis research in Nepal showed that parasitic infections have existed for many years, but recording them on the basis of research is still in its

infancy. The available data on taeniasis indicated that the disease is very severe and developing into a serious public health problem [16].

### CONCLUSION

The taenia species was found high in school children of Itahari Municipality. Risk factors like water treatment, hand washing before meal, bathing, hand washing after defecation, sandal wear, habit of nail biting and thumb sucking are positively associated with taenia infestation.

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