Porcine Cysticercosis in the Magar Community of Syangja District

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Abstract

A cross sectional study on the prevalence of porcine cysticercosis was carried out among the resource poor Magar Communities of Syangja District, Nepal. A total of 419 live pigs from four areas in the district (Tindobate, Tulsibhanjyang, Jagatradevi and Walling) were randomly selected and examined by lingual examination for cysts of *Taenia solium*. In addition, serum samples were collected randomly from 204 of these pigs for immunodiagnosis of antibodies to *T. solium*. Finally, a questionnaire survey was conducted among the Magar pig farmers. The lingual examination revealed that 136 of the 419 live pigs examined (32.5%) were positive for *T. solium* cysts. Likewise, serological testing with the EITB indicated that of 204 pigs tested 48 were positive for antibodies to *T. solium* (23.5%). The questionnaire survey showed that the farmers were aware of *T. solium* infections in pigs under a local name "chamley" which means rice as it is thought that the cysts arise from feeding the pigs with rice washings. The Magar people were found to be ignorant of the role of humans in transmission of and human infection with cysticercosis. Risk factors associated with transmission of porcine cysticercosis were found to include lack of hygiene and sanitation, animal husbandry practices, lack of meat inspection and the habit of eating raw pork. It is concluded that porcine cysticercosis is a major health and agricultural problem in the Magar communities and health education, meat inspection and improved pig husbandry practices are highly warranted.

Keywords: *Taenia solium*, cysticercosis, pigs, Nepal, prevalence

Introduction

In the past 20 years Nepal has experienced a high increase in the number of smallholder pig farms as the demand for pork especially in urban areas has increased dramatically. Postmortem surveys of pigs at slaughter establishments in Kathmandu and Dharan municipality conducted in 1997 and 1998 showed 13.6% (34/250) of pigs positive for cysticercosis (Joshi *et al.*, 2003). In connection with this a review of human cysticercosis cases on the basis of hospital-based data indicated that during the past five years, records from

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Patan, Bir and Kanti Children's Hospitals all in Kathmandu reported 62, 4 and 11 cysticercosis cases. At present, neurocysticercosis cases are diagnosed and treated at hospitals and clinics in India (Joshi *et al.*, 2003). Human helminthological surveys in Tanahun Districts showed that 18.4% of 152 people surveyed had *Taenia* infection (Thapa, 2000). In Syangja District in a community neighboring Magar, over 50% of farmers were excreting *Taenia* eggs (Gaihre, 2000).

Farmers in Syangja district raise pigs for home consumption. They build wooden pig pens, to house their pigs at night. Pigs are usually set free during the daytime to scavenge for food. As sanitation in Syangja is very poor, people defecate in open fields leaving their feces available for coprophagic pigs. Thus the situation in Syangja district of roaming pigs and poor sanitation leading to environmental contamination with *T. solium* eggs provides an enabling environment for the establishment of the *T. solium* lifecycle.

The aim of the study was to assess the prevalence of *T. solium* infection in pigs in a pig raising/pork consuming community known to be highly endemic for human taeniosis as well as to evaluate pig husbandry practices, pork consumption habits, sanitation and human knowledge of taeniosis/cysticercosis to be used for recommendations for prevention and control of the disease.

Materials and Methods

Syangja district lies at 28º 52' to 20º 13' latitudes and 83º 27' to 84 º 46' longitudes covering an area of 1164 sq. km. The district's altitude ranges from 336m to 2512m above sea level. The district's total population is 3,7 mill composed of Brahmin (33.5%), Magar (20.3%), Gurung (10.6%), occupational caste (13.6%), Chhettris (14.2%) and other castes (7.8%) which are all found throughout the district. A total of 437 households were randomly selected among the Magars from different areas in the district (203 from Tindobate VDC, 70 from Tulsibhanjyang VDC, 91 from Jagatradevi VDC and 73 from Walling Municipality. A questionnaire survey including questions on pig husbandry practices, knowledge of cysticercosis, hygiene and sanitation, and eating habits was conducted among all the households. From the same households a total of 419 pigs were examined for cysticercosis by lingual visualization and palpation as described in Gillespie, J.R., (1992) and Gonjalez et al., (1990) . Piglets less than 2 month old and pregnant sows were excluded from the study. From about 50% of the examined pigs (204), a blood sample was collected from the jugular vein using vaccutainers. The serum samples were prepared and stored at -80° C and after collection of all samples they were sent to the Center for Disease Control (CDC) Atlanta, Georgia for antibody detection using a cysticercosis enzyme-linked immunoelectrotransfer blot (EITB) test (Tsang *et al.*, 1998).

All farmers participating in the study was informed about the purpose and their risks, rights and benefits. Informed consent was given by all participating subjects.

Results

The overall prevalence was 32.5% using the lingual examination and 23.5% using the EITB method (Table 1). Area differences were noted with highest prevalence in Tulsibhanjyang (43.7%) and lowest in Jagatradevi (17.1%). Comparing male and female pigs regarding prevalence of cysticercosis showed no differences at all (data not shown). However, in general pigs above 6 month of age had significant higher prevalence of cysticercosis (35.1%) than pigs below 6 months (29.3%), assessed by the lingual examination ($\chi^2 = 55.1$, 3 df, $p < 0.001$).

Table 1. Prevalence of porcine cysticercosis examined by lingual examination and enzyme-linked immunoelectrotransfer blot (EITB) in 4 areas of Syangja District, Nepal.

	Lingual examination		Antibody ELISA	
Area	No examined	No positive (%)	No examined	No positive (%)
Tulsibhanjyang	71	31 (43.7)	27	10 (37.0)
Jagatradevi	70	12 (17.1)	32	0 (0.0)
Walling	134	39 (29.1)	33	2 (6.)
Tindobate	144	54 (37.5)	112	36 (32.1)
Total	419	136 (32.5)	204	48 (23.5)

The questionnaire survey reveled that 42.8% of the 437 interviewed persons were illiterate (Table 2). Highest illiteracy was found in Tulsibhanjyang and Tindobate areas where more than 50% of the people were unable to read and write. The majority of the interviewees (56%) worked exclusively at home. Pork meat was consumed in all four areas but only in Jagatradevi and in Walling respondents answered eating raw pork (Table 2). Nearly 52% of all interviewed did not use toilets but defecated only in the fields. Knowledge regarding the role of humans for transmission of and infection with *T. solium* cysticercosis/taeniosis was absent among all interviewed (Table 2). In contrast, all had heard about 'Chamley', the local name for *T. solium* cysts in pigs and pork meat, which means rice, as it is thought that the cysts arise from feeding the pigs with rice washings. Among the interviewed farmers, 55% were pig breeders, 23% kept only piglets and 22% only fatteners. Four different pig management systems were describe in the study area i.e. indoor, semi-intensive, free-range and tethering. Among these the semi- intensive system was widely applied with highest prevalence in Tindobate (68%). Tethering system was only common in Jagatradevi (47.5%) as the people there keep pigs for selling purpose. Overall among different feeding systems, semi- intensive was found widely applied (59.3%) and free- range system is less (9.4%) (Table 2).

Table 2. Risk factors for porcine cysticercosis identified by interviews and observations in 4 areas of Syangja District, Nepal.

Area	No exam.	% Illiteracy	% eating raw pork	% not using toilets	% with free roaming pigs
Tulsibhanjyang	70	37(52.9)	0 (0.0)	40 (57.1)	41(58.6)
Jagatradevi	91	16 (17.6)	16 (17.6)	75 (82.4)	43 (47.2)
Walling	73	29 (39.7)	20 (27.4)	8 (11.0)	7 (9.6)
Tindobate	203	105 (51.7)	0 (0.0)	108 (53.2)	135 (66.5)
Total	437	187(42.8)	36 (8.2)	231 (52.8)	226 (51.7)

*: at any point during their life.

Home slaughtering of the pigs, which occur when the pig is of 1-2 years old, took place in more than 90% of all cases and no official meat inspection was performed.

Discussion

Porcine cysticercosis was found highly prevalent among pigs in Syangja district. Major risk factors included lack of knowledge regarding the parasite and its transmission, poor hygiene and sanitation, free roaming pigs, home slaughtering with no meat inspection and consumption of raw pork.

Since the human taeniasis among the Magar ethnic groups was observed very high about 50% (Gaihre, 2000) but most of the community people were unaware of the most of the parasitic diseases except roundworm, *Ascaris lumbricoid*. Since most of them have already been suffered by such type of parasitic infection. It is observed that hygiene and sanitary condition of the Magar people are very poor. They keep their livestocks including the pigs in the same house at ground floor either at the pen or keep freely access to roam around and they stayed at the same floor or at the upstairs. During the study period observation was made that children are allowed to play and defecate at the yard too so that pigs easily get access the human faeces. In one of the household it was seen that family are making toilet on the top of the pigs pen. It seemed easy system for disposal for the human faeces instead of making toilet with spending lot of money. When people defaecate on top of the pen, faeces flows down to the wooden utensil kept to provide food for the pigs and immediately pigs feed them. In many cases Magar people have habit of using open toilet inside the bush or under the big trees or bamboos or in the crop fields which are the places where free roaming pigs can get easy access to the human faeces. Tindobate VDC which is at the highest altitude among the others have comparatively very few household with the latrine where the laboratory result also indicated high prevalence rate of porcine cysticercosis. The fact is satisfied by the stool examination result of the previous study which indicated that most of the community people were found to be suffered from the taeniosis including other intestinal helminthic parasites, mostly the *Ascaris lumbricoid.*

Literacy rate of the local community people plays very important role on transmission of zoonotic disease like taeniasis/ cysticercosis among human population as well as to reduce the prevalence rate of the disease in the animal aspect. Out of 437 persons, only 250 (57.2%) were literate and 187 (42.8%) were illiterate. The highest literacy rate was observed in Jagatradevi VDC where out of 91 responded Magars, 75 (82.4%) were literate. The Walling municipality (60.2%) obtained the second place. The lowest literacy rate was found in Tulsibhanjyang VDC (47.1%). The literacy rate of the Tindobate VDC was found 48.3%. In an average more than 50% of the interviewed people are literate i.e. can read and write.

The agent/host/ environment interrelationship in *Taenia solium* and its cysticercus depends in essence on the human faecal pollution of pig grazing by *Taenia* segments under circumstances favourable for egg survival. Pigs exist mostly by scavenging around their owners, huts and by rooting and grazing in the vicinity. Different four types of feeding systems were noticed in the studied areas i.e., indoor, semi-intensive, free- range and tethering. Among these, semi- intensive system is widely applied and was found maximum in Tindobate VDC (68%). Tethering system is not so widely applicable and was almost absent in both Tindobate VDC & Tulsibhanjyang VDC whereas it was found maximum in Jagatradevi VDC with 47.5% as the people there keep pigs for selling purpose. Overall among different feeding systems, semi- intensive was found widely applied (59.3%) and free- range system is less (9.4%).

The pork was consumed in different patterns. Overall 68.2% of responded people consumed cooked pork whereas boiled pork was less consumed by 4.3%. Similarly, 8.2% out of 437 respondent overall consumed raw pork. However in Jagatradevi VDC (17.6%) and Walling Municipality (27.4%) consumed raw pork only. There is no commercial involvement, no meat inspection by trained personnel and presumably no cognizance taken of any disease condition that is not both obvious and repulsive. As cysticercosis does not fall into such a category. It must be accepted that the only protection enjoyed by consumers against infection by tapeworms from cysticercus infestation carcases will lie in the throughness of cooking the meat before consumption. Or in some cases, a prolonged sojorn in the farm homestead deep freeze before cooking. But none of them have freezing facilities except it is assumed that some of them use deep cooking in these Magar people. Besides this rural butcheries is also common practice for butchers in municipality area to purchase animals on the hoof, either at sales or by private treaty and to butcher at their own premises. None of these small butcheries have freezing facilities adequate to handle measly carcasses. The high prevalence of porcine cysticercosis among free-range pigs of the study area is due to the fact that. 1) The scavenging pig is both of necessity and by inclination remarkably undiscriminating in its tastes and has been observed to eat a selection of oddities ranging from soap to canned pineapple, more importantly it is not averse to consuming human faeces. 2) The ripe segment of *Taenia solium* are but poorly motile several are usually passed with the human stool and they remain in situ and available for porcine consumption.

Regarding the killing process of the viable cysts from the measly pork, according to the available research findings no cysts survive a temperature of -15^{0}c for 75 minutes, whether naked or situated in muscle, and all cysts were dead in less than 30 minutes at -18^{0}c. The *T. solium* cysticerci will survive a temperature of 45^{0}c for more than 25 minutes. They will survive 48^{0}c for 15 but not 20 minutes and they will survive 50^{0}c for 6 but not 8 minutes. At 60^{0}c or higher, they will not survive for 5 minutes (Gemmel, 1983; Sarti et al., 1992). A variety of methods available to kill tapeworm cysts without destroying the meat of the host animal. These include freezing, cooking, drying ad pickling, all of which are recognised methods of preparing meat for human consumption (Gemmel, 1983).

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