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Prevalence of Gastrointestinal Parasites of Domestic Pig (*Sus scrofa domesticus* Linnaeus, 1758) in Two Farms of Pokhara Valley

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Abstract: Gastrointestinal helminthes parasite infection is a major militating factor against profitable animal production worldwide. The present study was conducted to determine the general prevalence of gastrointestinal parasites of pig in two farms viz. Phursekhola pig farm and Saaru pig farm of Pokhara. A total of 120 faecal samples were collected by opportunistic random faecal sampling method. Iodine wet mount and different concentration technique (floatation and sedimentation) were used for faecal qualitative. Out of 120 faecal samples examined, 73 faecal samples were positive with 60.83% prevalence of parasitic infection. Total of 8 GI parasites that includes protozoan and helminth among which *B.coli* (25%) and *Trichuris* sp. (20.83%) showed the highest prevalence. Statistically, the difference in GI parasitic infection in specific parasites were found to be insignificant ($\chi^2 = 38.083$, $p>0.05$). Among two farms the Saaru pig farm (71.67%) showed the higher prevalence as compared to Phursekhola pig farm (50%). Statistically, the difference in prevalence of GI parasitic infection among two farms found to be insignificant ($\chi^2 = 1.11$, $p>0.05$). Whereas the difference in prevalence of single infection (64.38%) and mixed infections (35.61%) were insignificant ($\chi^2 = 3.50$, $p>0.05$).

INTRODUCTION

The domestic pig (*Sus scrofa domesticus or Sus domesticus*), often called swine or hog is a large even-toed ungulate. It is most often considered to be a sub-species of the wild boar which was given the name Sus scrofa by Carl Linnaeus in 1758; following from this the formal name of domestic pig is Sus scrofa domesticus[1]. Gastrointestinal parasites are responsible for substantial loss of productivity in swine and other livestock industry. They constitute a major impediment to efficient and profitable livestock production[2]. Gastrointestinal parasitism in swine affects swine's performance in terms of efficient feed conversion, poor growth rate, reduced weight gain and the condemnation of affected organs after slaughter[3]. It has been recognized that parasites of pigs cause major economic losses globally to the pig and pork industries and farming

communities as a consequence of reduced feed conversion weight gains and the condemnation of affected organs after slaughter[2, 4-7]. The prevalence rate of GI parasites is influenced by various socio-economic and cultural factors, religious beliefs, cultural practices, etc[8]. The indigenous pig predominates in smallholder areas where it is kept under the free range system and thrives on low planes of nutrition[9].

These pigs are primarily scavengers, utilizing food scraps thrown away by people. The roaming of pigs favors the uptake of internal parasite eggs[10], making the pigs particularly susceptible to infestation with internal parasites. Moreover, the warm and humid conditions of the tropics and the inadequate treatment of local pigs against parasitic diseases[9], invariably cause them to carry heavy burdens of Gastrointestinal (GI) nematodes. Clinical signs of diarrhoea and emaciation noted on these pig farms at the time of sampling may have been caused by *Coccidia* sp., *Oesophagostomum* sp., *Trichuris suis* and *Strongyloides* sp., since, these parasites have been reported to cause such clinical signs[11]. Diseases that are transmitted between pigs and humans (zoonoses), namely hepatitis E, Japanese encephalitis, trichinellosis, cysticercosis and taeniasis. Taenia solium causes human and porcine cysticercosis and is considered one of the most important diseases in Southeast Asia and a neglected zoonotic disease[12]. Pigs parasites commonly seen include protozoa (one-celled animals), helminths (worms) and arthropods (insects and mites). The effects vary from benign to acute death[13]. The most important helminth species, classified into three major groups. They enter the body through different routes including mouth, skin and the respiratory tract[14]. These include cestodes (tape worms), nematodes (round worms) and trematodes (Flukes).

The most common parasites of the pigs are *Hyostrongylus* (redstomach worm), *Gnathostoma, Ascaris* (large roundworm), *Strongyloides* (threadworm), Globocephalus (hookworm), *Trichostrongylus, Oesophagostomum* (nodular worm), *Trichuris* (whipworm), *Metastrongylus* (lungworm), *Stephanurus* (kidney worm), *Trichinella, Fasciolopsis* (intestinal fluke), *Gastrodiscus, Opistorchis, Fasciola* (liver fluke) *Schistosoma* (bloodfluke) *Taenia solium, Cysticercus cellulosae, Cysticercus tenuicollis* species, etc.

MATERIALS AND METHODS

Study area: Pokhara metropolitan is the second largest city of Nepal. It is the head quarter of both the Western development region and the Kaski district. It lies on the geographical coordinates of 28.27° latitude and 83.97° longitude. It covers an area of 55.66 km^2, i.e., 2.7% area of the district and 0.04% area of the nation. The temperature usually ranges between 2-33°C with an average annual rainfall of 3880 mm whereas the elevation ranges between 827-1740 m above sea level. There is exclusively great floral and faunal diversity in Pokhara valley due to the prevalence of a wide range of climatic and topographical variations. The present study area are Phursekhola Pig Farm in Birauta and Saaru Pig Farm in Mahatgauda (Fig. 1).

Fecal samples collection: Fecal samples were collected from two different farms namely, Phursekhola pig farm and Saaru pig farm of Pokhara. Total of 120 fresh fecal samples were randomly picked up and collected using a disposable polythene hand glove and preserved with 2.5% potassium dichromate (K2cr2o7). The collected sampleswere transported to the Central Department of Zoology for further processing. Following technique were used to process the eggs/oocyst from the fecal samples.

Simple floatation and sedimentation technique: Simple floatation technique and sedimentation technique used[15-17]. This technique was carried out as follows: Fresh faecal sample of 2-3 g was gently mixed using pestle and mortar with a saturated salt solution. It was then sieved using a siever in to floatation bottles which was filled to the brimand was covered with a cover slip

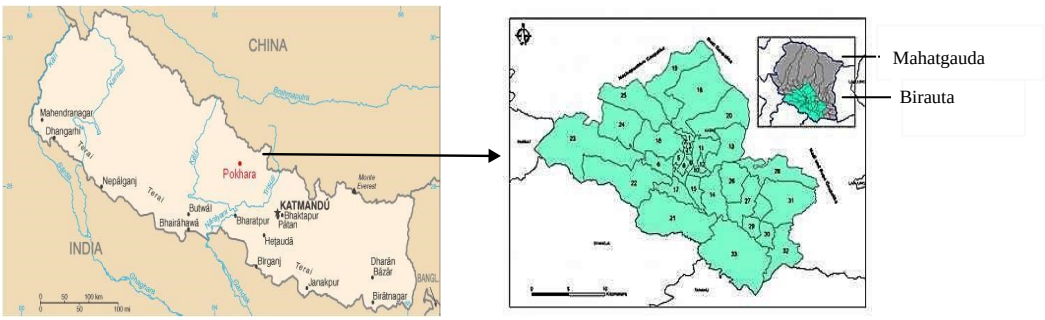

Fig. 1: Map

for 15-20 min. The cover slip was then removed and placed on a clean glass slide, it was then put under stage of a light microscope and was observed with a magnification of 40x.

In the sedimentation technique, the supernatant was discarded gently leaving the heavier particles at the bottom of the floatation bottle, a drop was then put on a clean glass slide and covered with a cover slip and was observed using the magnification of 40x. The sedimentation technique was used in this study because some oocyst/egg of parasites such as the strongyloides species are heavier which does not float on top of the floatation bottle but settle at the bottom of the bottle as described by Williams[15], Anne and Gary[16], Soulsby[17].

Data analysis: On the basis of laboratory experiment, the data was recorded. The recorded data were coded and interpreted into Microsoft Excel 2010. Statistical analysis was performed using "R", Version 3.3.1 Software packages. Chi-square test was used for statistical analysis of data. In all cases 95% Confidence Interval (CI) and $p<0.05$ was considered for statistically significant difference. Percentage was used to calculate prevalence.

RESULTS AND DISCUSSION

Overall prevalence of GI parasites of pigs: During the study period about 60.83% pigs showed single and multiple infection with one or more types of GI parasites. Totaleight types of GIparasites in pig have been identified for the first time from Pokhara. *B.coli* showed the highest prevalence rate in pigs (35/120) which is followed by*Tri churis* sp. (30/120), *Isospora* sp. (10/120), *Eimeria* sp. (7/120), *Ascaris* sp. (12/120), *Strongyloides* sp. (10/120), *Trichostrongylus* sp. (14/120) and *Fasciolopsis* sp. (2/120) (Fig. 2). Statistically, there was no significant difference in specific GI parasite in pigs ($\chi^2 = 38.083$, $p>0.05$).

Prevalence of protozoan and helminth parasites: Out of 73 total positive samples (64.38%) were positive with protozoans and (35.62%) with helminthes parasites (Fig. 3). Statistically, the difference in prevalence of GI parasitic infection among Protozoans and Helminthes were found to be ($\chi^2 = 3.505$, $p>0.05$).

Area-wise prevalence: Among two study area with 60 samples from each area (Saaru pig farm and Phursekhola pig farm) were taken for examination. Saaru pig farm had highest prevalence of GI parasites were in Saaru pig farm compared to Phursekhola pig farm (Fig. 4). Statistically, the difference in prevalence of GI parasitic infection among study area was found to be ($\chi^2 = 1.11$, $p>0.05$).

Parasitic diseases are one of the major obstacles for pig industry and is considered to be next in importance after African swine fever[18]. Helminthiasis in pigs is often associated with subclinical infections; poor feed conversion and delayed achievement of market weight. Information on the epidemiology of parasites of animals is very important in assisting farmers to develop preventive measures. Several studies have been conducted into the prevalence and economic importanceof gastrointestinal parasites in pigs. The present study revealed that overall prevalence of gastrointestinal parasites recorded among 120 samples from two farms to be 60.83%. Present study is supported by similar prevalence rates reported by Tiwari *et al*.[19] in Grenada, West Indies (68.78%), Kristina etc. in Eastern Uganda (61.4%), Julius etc. in North central state of Nigeria (55%), Garesu etc in Ethiopian (61.8%) and Mandeep etc. in West Indies (56.5%). The high prevalence rate of GI parasites may be due to poor management and least concern of government. Out of eight genus of GI parasites three genera were protozoan (*Isospora* sp., *Eimeria* sp. and *B.coli*) five genera of helminths: *Ascaris* sp., *Trichuris* sp., *Strongyloides* sp., *Trichostrongylus* sp. and *Fasciolopsis* sp. were identified. Among them the prevalence rates of *B.coli* (25%) was higher which was found similar in previous studies done by Sowemimo *et al*.[20] Atawalna *et al*.[21] and Akannio *et al*.[22] This findingmay be due to contamination of food, soil and difference in geographical area. The difference in the prevalence may be due to differences in climatic conditions, husbandry practices, breeds and inherent characteristics such as host immunity

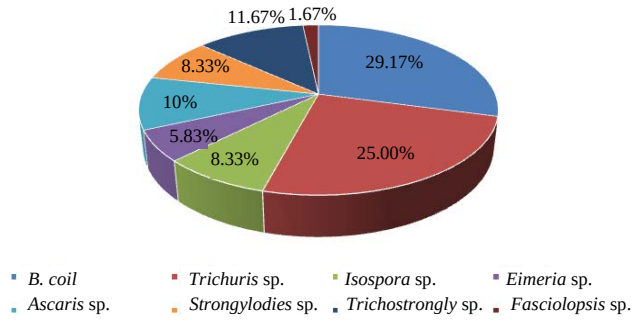

Fig. 2: Prevalence of specific GI parasites

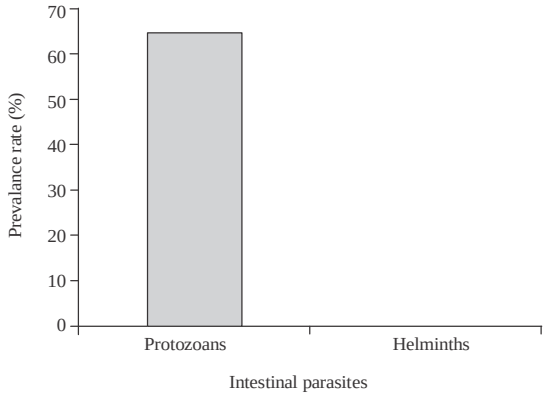

Fig. 3: Prevalence of protozoan and helminth parasites

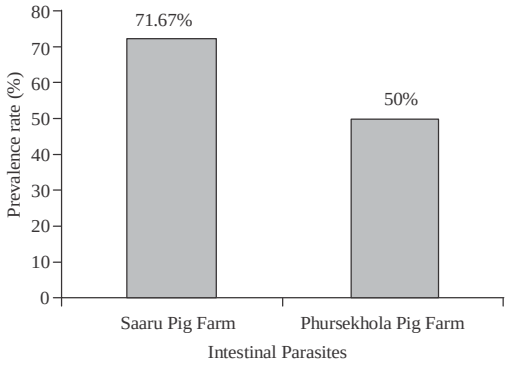

Fig. 4: Prevalence of GI parasitic infection among study area

in the study region. The prevalence of protozoans was higher (64.38%) than helminths parasites (35.62%) in present study. This finding is higher than the finding of Gueye *et al*.[23] in Nigeria (2.08%) and lower than the finding of Edmund *et al.* (2005) in Malaysia (73.3%). It was due to differences in climatic conditions, management systems and local circulating parasites in the locality. Among eight different Gastrointestinal parasites identified in present study, *B. coli* (25%) showed the highest prevalence. The prevalence rate of this study is higher than Gueye *et al*.[23] in Nigeria (2.08%) and lower than Edmund *et al*.[24] in Malaysia (53.3%). Similarly, present finding showed the prevalence of *Trichuris* sp. Showed the prevalence of 20.83% as which was similar to the finding by Edmund *et al.*[24] in Malaysia (17.5%), Salifu *et al.*[25] in River state Nigeria (15%) and higher than the result by Kristina *et al*.[26] in Eastern Uganda (3.45), Mandeep etc. in England (1%) and lower than Tidisk *et al.*[27] in Nigeria (59.64%), Salifu *et al*.[25] in River State Nigeria (47.25%). The difference in the prevalence of specific parasites in different areas may be due to differences in climatic condition, husbandry practices, breeds and inherent characteristics such as host immunity in the study region.

The study area with highest prevalence of GI parasites was in Saaru pig farm 43(71.67%) and the lowest was in Phursekhola pig farm 30(50%). Statistically, the difference in prevalence of GI parasitic infection among study area was found to be insignificant (χ^2 = 1.11, p>0.05). It might be because of different climatic condition, food resources and environment. Present study indicated that pigs in two farms of Pokhara valley were highly susceptible to GI parasites. Therefore, sustainable ways for controlling the parasitic infection and further studies need to be designed for the health and conservation of pigs. The result of this study has revealed that pig faeces could be an important source for some parasites capable of infecting humans. In a community setting where pigs are reared and pig meat is consumed by a large part of the population, they could be involved in zoonotic helminthosis and a further investigation should study the possible impact of parasitic infections of pigs on public health in Nepal.

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