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Original article

Occurrence of gastrointestinal parasitic infections in pig of Dinajpur district, Bngladesh

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ABSTRACT

A three month long cross-sectional study on gastrointestinal parasitism of pigs was conducted two upazillas of Dinajpur District, Bangladesh. A total of 100 fecal samples were collected randomly from different households of the two upazillas of the pertinent district. Samples were examined by routine coproscopical methods. The investigation revealed that the overall prevalence of gastrointestinal parasitic infections was 65% (either single or mixed) in the studied population. Among different gastrointestinal parasitic infections, occurrence *Ascaris suum* was the highest (38%) followed by *Macracanthorhynchus hirudinaceus* (22%), *Strongyloides ransomni* (20%) and *Trichuris suis* (5%).Age specific infections rate revealed that pigs age between (>5-12months) were affected more by different gastrointestinal parasitic infections where *Ascaris suum* infection constituted the highest, (45.24%)and *Macracanthorhynchus hirudinaceus* infection was 35.71%, that was statistically significant (P>0.05). On the other hand, infection caused by *Strongyloides ransomni* (26.19%) was more frequent in age group ≤ 6months of age whereas age group >12months showed very lower prevalence than other two groups for all infections except *Oesophagostomum sp* (6.25%). Further, occurrence of protozoan parasites were common in

age groups (>5-12months) which was not statistically significant (P>0.05). Nevertheless, sex specific infection rate explored that female pigs showed more susceptibility to different gastrointestinal parasitic infections in compare to male. The occurrence of *Ascaris suum* infection was the highest (40.48%) in female. Conversely, occurrence of *Hyostromgylus rubidus* infection was the maximum (5.17%) in male pig in compare to female (2.38%). Further, infection caused by coccidian protozoa or *Balantidium coli* were very lower in both gender of the study population but it was not statistically significant. It could be stated that the current investigation was fresh of its type which will be acted as bench mark for further study in this area. Moreover, as it was a limited study where breed and topographical variation, seasonal pattern of the diseases were not included. Hence, it was suggested further extensive investigation on gastrointestinal parasitism to overcome the limitations of the current study which will assist to determine the important predictors related to such parasitic diseases.

1. Introduction

Bangladesh is an agricultural country. Livestock is one of its important components which provide protein, solve unemployment and earn foreign exchange (Taylor and Roese, 2006; Cole, 1996). Bangladesh is one of the densely populated countries in the world. Most of the rural people of the country are landless and they live below poverty (United States Census Bureau, 2015). A large number of peoples are unemployed and about 50% of the people suffer from malnutrition (World Bank group, 2012). Livestock not only assists to upgrade the financial condition but also makes a sustainable contribution to human nutrition (Nabarro and Wannous, 2014). Large animal & small animal constitute the major portion of livestock. The present population of livestock is 23.12 million cattle, 1.39 million Buffalo, 24.10 million goat and 3.07 million sheep (DLS, 2010-11). But the pig population has been not counted yet. Pig mainly concentrated in the three districts of Chittagong hill tracts in Bangladesh. Besides, a considerable number of pig populations are present in plain land like Dinajpur which are reared by Swangtal tribal. Pigs are fast growing and one of the most prolific livestock breeds (Taylor and Roese, 2006). Pig is considered as the richest source of animal protein at a lower cost for the peoples who consume pork. In global perspective, pigs were used for production of meat and bristles. However, with the advent of nylon, pig bristles have lost its market value (Long et al., 1990). Nevertheless, till date, pork is an important source of protein in western countries. In Bangladesh, domestic breeds of pig are reared on garbage, kitchen waste and human excreta. Productivity of domestic breeds is low. (Hossain et al., 2011). In most of the areas of Rangamati , Khagrachari and Dinajpur districts, rearing of pig is done by poor people who neither have means nor know about pig management. Domesticated pigs called swine, are raised commercially for meat (generally called pork, hams, gammon or bacon), as well as for leather. Their bristly hairs are also used for brushes. Due to their common use as livestock, adult swine have gender specific names: the males are *boars* (or sometimes "hogs") and the females are *sows*. Young swine are called *piglets* or *pigs*. Pork is one of the most popular forms of meat for human consumption, accounting for 38% of worldwide meat production (Broom et al., 2009). In the tropical and sub-tropical areas, parasitic infections in pigs are estimated to be second to African swine fever. Infection with parasites is associated with significant economic losses evidenced by decreased litter size, poor growth rate, reduced weight gain, organ condemnation at slaughter and death (Tiwari et al., 2009).

Gastrointestinal parasites are one of the major constraints to efficient swine production of all ages (Radostits et al., 2000). Swine raised in intensive operations are less prone to gastrointestinal infection however; the large round worms (*Ascaris sp*), whipworms (*Trichuris sp*) and the nodular worms (*Oesophagostomum sp*) are often found in such operation (Weng et al., 2005; Eijck and Borgsteede, 2005). The large round worms' remains the most

prevalent while parasite such as kidney worms, lungworms, red worms and thread worms are only found in pigs raised on free range (Tamboura et al., 2006; Radostits et al., 2000). Gastrointestinal parasitism in swine affects swine's performance in terms of efficient feed conversion, growth rate and general health status (Hale and Stewart, 1987). They've also been associated with depressed immunity in infected animals leading to decreased ability to fight off infection thereby predisposing them to concurrent infections with disease pathogens (Intervet, 2011). The disease is also associated with a lot of economic losses compounded by the fact that once roundworm infection establishes in a conventional farm, it's always very difficult to eliminate (Intervet, 2011). Occurrence of gastrointestinal parasitic infection in different areas greatly depending upon the diver intrinsic and extrinsic epidemiological and biological factor associated with them (Blood et al., 2007). Zoonoses in swine are increasingly becoming a global public health concern. Understanding how livestock farmers perceive animal illnesses will help to develop locally acceptable and effective public health intervention strategies (Nahar et al., 2012). Despite significant losses by gastrointestinal parasitism, the problem is often neglected and overlook as majority of infected animals show a number of little obvious clinical signs throughout their productive life and their effects are gradual and chronic (Reza et al., 2010). Considering the above facts, the present study was undertaken to fulfill the following objectives:

- To investigate the occurrence gastrointestinal parasitic infections in pig at the back yard farm level of the Dinajpur district, Bangladesh.
- To determine the effect of different factors such as age, sex etc. in the occurrence of such diseases.

2. Materials and methods

2.1. Description of study area and duration

The study was conducted in two Upazilla namely Birganj and Kaharol of Dinajpur district, Bangladesh. The study was under taken for a period of 3 months starting from August'2014 to October' 2014.

2.2. Selection of animals and survey design

Target animal and age groups:

Indigenous/crossbred pigs were selected for this study as target animal. To determine the age susceptibility of different parasitic infections, pigs were categorized into three sub-groups as ≤4 months, >5-12months and >12months aged pig (Tamboura et al., 2006).

Target sampling:

A total of 100 fecal samples were collected randomly from several villages of two respected upazilla in Dinajpur district of Bangladesh. A prototype questionnaire was used to record the information like area, age, sex etc. In the present study, the minimum age of the pig was 1months and maximum 36 months.

2.3. Sample collection and preservation

Feces were collected directly from rectum and stored in plastic containers. Then, the container was filled with formalin (10%) and refrigerated at 4^0C temperature. During sample collection, labeling of the samples were strictly maintained to prevent the misinterpretation among the collected samples.

2.4. Examination of the sample

In addition to gross examination of fecal samples (color, consistency, blood or mucus, etc.), three different types of qualitative tests, namely, direct smear, floatation and sedimentation techniques were used to examine the fecal sample. Sugar Salt Solution was used as floatation fluid. At least two smears were prepared from each sample for each test to identify the morphological characteristics of eggs, cyst, Oocyst (Hendrix, 2006; Urquhart et al., 1996; Hansen and Perry, 1993, Soulsby, 1982; Benbrook and Sloss, 1962).

2.5. Statistical analysis

The obtained information was imported, stored and coded accordingly using Microsoft Excel-2007 to STATA/IC-11.0 (Stata Corporation College Station) for analysis. The result were expressed in percentage with P-value for Chi-Square Test. Significance was determined when $P<0.05$.

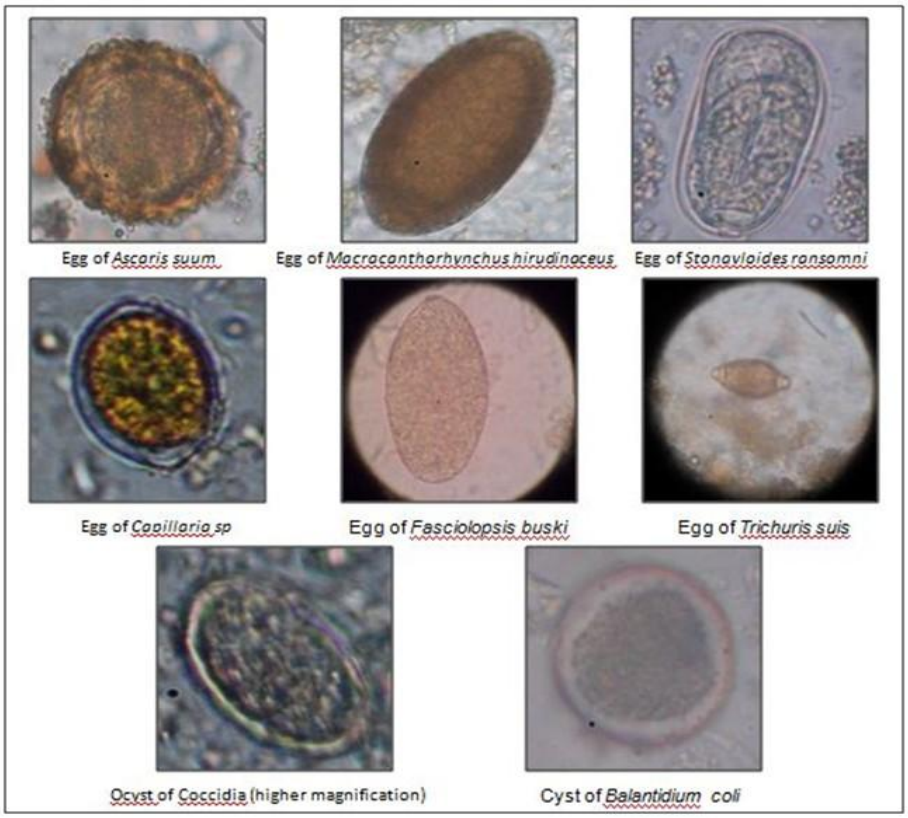

Plate I. Microscopic pictures of eggs of gastrointestinal parasites of pig (during the study).

3. Results

3.1. Overall percentage of gastrointestinal parasites of pig

During the current investigation, an approach was taken to determine the status of gastrointestinal parasitic infections in study pigs. The overall prevalence of gastrointestinal parasitic infections (either single or mixed infection) was 65%.

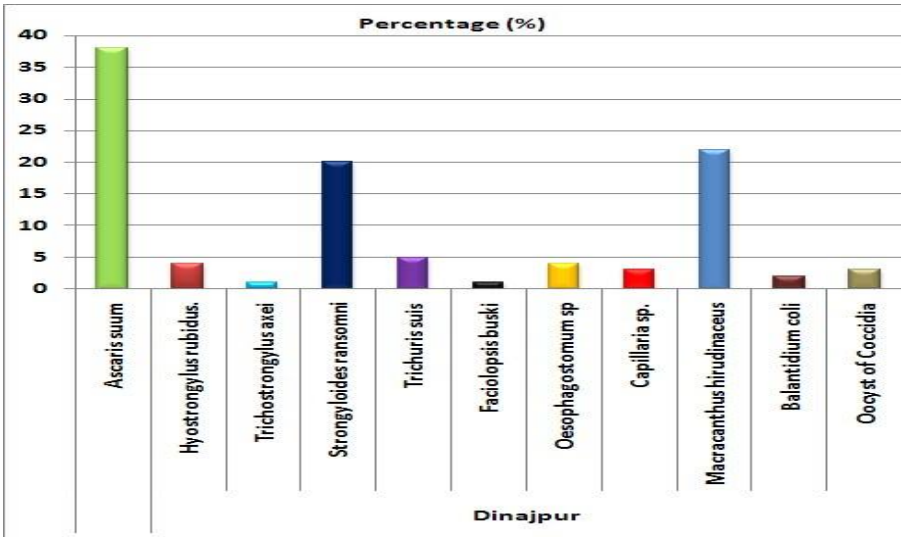

Fig. 1. Overall infection rate of gastrointestinal parasitic infections in pig.

Among different gastrointestinal parasitic infections, prevalence of *Ascaris suum* infection was the highest which was 38% in study population. The second most common parasitic infection was caused by *Macracanthorhynchus hirudinaceus* (22%) followed by *Strongyloides ransomni* (20%). The lowest parasitic infections were also recorded for *Trichostrongylus axei* (1%) and *Faciolopsis buski* infection (1%).However, slightly lower infection rate was recorded in *Hyostrongylus rubidus, Trichuris suis* and other protozoan species (Fig. 1).

3.2. Age specific occurrence of gastrointestinal parasitic infections

Occurrences of gastrointestinal parasitic infections were also influenced by the age of animal. During this investigation, it was observed that > 6month-12 month old pig were more susceptible to different parasitic infections in compare to other two age groups.

Table 1
Age-specific occurrence of gastrointestinal parasitic infections.

Parasitic infections	Age Category			Pearson chi^2 value	P.value
	≤4 Months	>5-12 Months	>12 Months		
Ascaris suum	35.71(15)	45.24(19)	25(4)	2.17	0.33
Hyostrongylus rubidus	7.14(3)	2.38(1)	0	2.03	0.36
Trichostrongylus axei	2.38(1)	0	0	1.39	0.49
Strongyloides ransomni	26.19(11)	14.29(6)	18.75(3)	1.87	0.39
Trichuris suis	9.52(4)	2.38(1)	0	3.25	0.19
Faciolopsis buski	0	2.38(1)	0	1.39	0.49
Oesophagostomum sp	2.38(1)	4.76(2)	6.25(1)	0.56	0.75
Capilaria sp.	7.14(3)	0	0	4.27	0.11
Macracanthorhynchus hirudinaceus	16.67(7)	35.71(15)	0	9.81	0.007*
Balantidium coli	2.38(1)	2.38(1)	0	0.38	0.82
Oocyst of Coccidia	0	7.14(3)	0	…	…

*Significant when P<0.05.

Among different parasitic infections, it was observed that *Ascaris suum* was highly prevalent in >6-12 months of old pig which was 45.24% followed by ≤6 months of aged pig (35.71%). Furthermore, *Macracanthorhynchus hirudinaceus* infection (35.71%) was more common in > 6 -12months aged pig followed by ≤6 months of age (16.67%) which was statistically significant (P<0.05). *Strongyloides ransomni* infection was more common in all the age groups but more frequent in the age group ≤6 months and older pigs. Although, occurrence of protozoa in all the age groups were less frequent but 7.14% Coccidian infection was observed in >6-12 months of age.

3.3. Sex specific infection rate of gastrointestinal parasitic infection in pig

Table 2
Sex wise percentage of gastrointestinal parasitic infection of pig.

Parasitic infections	Male	Female	Pearson chi^2 value	P.value
Ascaris suum	36.21(21)	40.48(17)	0.1885	0.664
Hyostrongylus rubidus	5.17(3)	2.38(1)	0.4943	0.482
Trichostrongylus axei	1.72(1)	0	0.7315	0.392
Strongyloides ransomni	17.24(10)	23.81(10)	0.6568	0.418
Trichuris suis	3.45(2)	7.14(3)	0.7	0.403
Faciolopsis buski	1.72(1)	0	0.7315	0.392
Oesophagostomum sp.	6.9(4)	0	3.0172	0.082
Capillaria sp.	1.72(1)	4.76(2)	0.7725	0.379
Macracanthorhynchus hirudinaceus	18.97(11)	26.19(11)	0.7410	0.389
Balantidium coli	3.45((2)	0	1.4778	0.224
Oocyst of Coccidia	1.72(1)	4.76(2)	0.7725	0.379

Significant when P<0.05.

In the current study, it was exposed that female pig showed more susceptible to different gastrointestinal parasitic infections than male but it was not statistically significant. However, prevalence of *Ascaris suum* infection was the highest in female pig (40.48%) followed by male (36.21%). Occurrence of *Macracanthorhynchus hirudinaceus* infection in female was 26.19% in compare to male (18.97). *Strongyloides ransomni* infection (17.24%) was also more common in female pig of the study population. On the other hand, occurrence of protozoan infection such as *Balantidium coli* and Coccidian parasitic infection was slightly higher in male group in compare to female but it was not statistically significant (P>0.05).

4. Discussion

4.1. Prevalence of gastrointestinal parasitic infections in pig

4.2. Overall prevalence of gastrointestinal parasitic infections

The overall prevalence of gastrointestinal parasitic infections in pig of this study found similar with the reports of Autunes et al. (2011) and Tiwari et al. (2009) who recorded 62.9% and 68.78% respectively. The observation greatly varied from the reports of Ismail *et al.* (2010), Weka and Ikeh (2009) and Marufu et al. (2008) who recorded 73.5%,86.9% and 58.7% respectively at different countries of the world. Variation in the occurrence of such gastrointestinal parasitic infections might be due to geo- climate conditions, sample size, breed, age, sex, plane of nutrition, stress, availability of intermediate host, vegetation, grazing pattern, rearing and husbandry measures, anthelmintic therapy, genetic resistance etc. (Hansen and Perry, 1993).

Prevalence of *Ascaris suum* infection of this study was consistent with the observation of *Tamboura et al.,* (2006) at Burkina Faso in Nigeria who recorded 40%.On the other hand, The present result varied from the findings of Yadav et al. (1989), Morris et al. (2009) and Nwoha and Danie (2011) who recorded 51.67%, 53%, and 50% respectively at different corners which was greater than the result of this present study. The prevalence of *Ascaris suum* of this study was higher due to the thick egg shell which make the egg resistant to cool and harse circumstances for its prolong survival in soil. (Soulsby, 1982).Further, contamination of the habitats as well as scavenging nature of the pig may also contributed to higher prevalence of such parasitic infections in the study population. (Lewis et al., 2006).

Prevalence of *Macracanthorhynchus hirudinaceus* infection of this study was almost similar with the observation of Muela *et al.* (2001) who recorded 21%.The study result also showed some harmony with the result of Anonymous. (2013) who recorded in *Journal of Helminthology,* 19% infection in Bursa province of Turkey. On the other hand, observation of this study greatly varied from the result of Solaymani et al. (2003) who noticed 41.6% prevalence in Luristan province of Western Iran. Variation in the occurrence of *Macracanthorhynchus hirudinaceus* infection influenced by the climatic factors and presence of intermediate host which might be one of the causes of higher prevalence in this study. (Soulsby, 1982) More over the eggs are very much resistant to environmental extremes which ensure the longer survivality in the environment. Presences of dung beetles were another contributing factor which enhanced the infection rate in the study population. (Urquhart et al., 1996)

Occurrence of *Strongyloides ransomni* infection found in accordance with the observation of Tomboura et al. (2006) and Morris et al. (2009) who recorded 21% and 19.4% respectively. Higher prevalence about 57.4% infection of *Strongyloides ransomni* was observed by Antunes et al. (2011) Variation in the occurrence of such infection might be due to geo-climatic condition (Kakar et al., 2008) or poor same size (Bachal, 2002).

Infection caused by *Trichuris suis* of this study was in line with the findings of Weng *et al.* (2005), Nsoso *et al*. (2000), Permin et al. (1999) and Marufu et al. (2008) who recorded 5.7%, 6.8%, 4.6% and 4.2% respectively in different places of the world. Higher prevalence was recorded by Morris et al. (2009) which was 35.7%. Conversely, lower prevalence was recorded by Tamboura et al. (2006) about 1%.Variation in the occurrence of such infection might be due to geo-climate conditions of the study areas as well as husbandry practices. (Hansen and Perry, 1993)

Occurrence of *Fasciola sp* infection of this study was almost similar with the findings of Tomass et al. (2013) who recorded 1.8% infection in Tigray region of Ethiopia.

Prevalence of *Capillaria sp* infection of this study was slightly varied from the findings of Muela et al. (2001) who reported 2% infection while present study showed 3% infection.

Occurrence of *Hystrongylus rubidus* infection found in accordance with the result of Anonymous. (2013) who reported 4% infection. Similarly, the result of the present study varied from the observation of Tamboura et al.

(2006) and Nwoha and Danie (2011) who estimated 11% infection in Burkina Faso of Nigeria and 17% in Umuahia city of Abia state respectively.

Prevalence of *Oesophagostomum spp* infection of this study was quite similar with the findings of Abdu and Gashaw (2010) who recorded 6.7% in Holleta of Ethiopia. On the other hand, greater variation was found by Weng *et al.* (2005), Tamboura *et al*. (2006) and Lai et al. (2011) who recorded 24.95%, 18% and 16.53% respectively in different corner of the world. Variation in the occurrence of such infections might be due to geo- climate diversity, animal enterprises, husbandry measures and nutritional status, deworming etc. (Hansen and Perry, 1993).

Infection caused by the Oocyst of Coccidian parasite of this study showed greater variation from the findings of Weng et al. (2005), Morris et al. (2009) and Kariga et.al (2010) who recorded 24.9%, 21% and 33% respectively in different countries of the world.

Infection rate of *Blantidium coli* was partially similar with the observation of Uysal et al. (2009) who noticed 1.5% infections in Istambul of Turkey. Further the result of present study varied from Weng et al. (2005) and Lai. et al. (2011) who recorded 47.2% in Guangdong Province and 22.79% in Chongqing in China respectively.

4.3. Age specific prevalence of gastrointestinal parasitic infections

In current study, influences of age on the occurrence of gastrointestinal (GI) parasitic diseases were also observed. The frequency of GI parasitic infections especially, *Ascaris suum* and was found more in >6-12 months aged animal. In case of earlier infections similar observation was found in Tamboura et al. (2006) at Burkina Faso in Nigeria and Tomass et al (2013) in Ethiopia who reported higher prevalence of *Ascaris sp* in >5-12months age group, moderate infection in <5 months age group and lower infection in >12 months age group. Higher prevalence in young pigs in compare to older pigs might be due to transplacental transmission of 3rd larval stage (L_3) or postnatal infection. (Lay et al., 2008; Urquhart et al., 1996; Soulsby, 1982)

In the current study, prevalence of *Macracanthorhynchus hirudinaceus* infection found higher in >6-12 months age group which was statistically significant. The lower prevalence of gastrointestinal parasites in younger (<5 months) and in the older (>12 month) age groups might be because the younger pigs were lactating and hence partially scavenging on garbage for feeding. On the other hand, most of the older pigs were either pregnant females (sows) or males kept for breeding (boars) and therefore were given special attention by the owners in terms of additional feed to reduce their scavenging dependency on garbage which was considered to be one of the factors for lower infection with different gastrointestinal parasites. (Tomass et al., 2013). However, the age group (>6-12 months) mostly scavenging on garbage for feed, where there dung beetles were available.

In the present study, higher prevalence of *Fasciola sp* and Coccidian parasite was found in >6-12 months age group. The result was in accordance with Tomass et al. (2013) who recorded in >5-12 months group at Tigray region in Ethiopia.

In current study, higher infection rate of *Hyostrongylus rubidus*, *Storngyloides ransomni, Trichuris suis, Capillaria sp* was found in <6 months age group which was supported by Visco et al. (1977) and Bugg et al. (1999) who observed higher occurrence of such internal parasites in younger animal.

4.4. Sex specific prevalence of gastrointestinal parasitic infection

In the present study, infection caused by *Ascaria suum. Strongyloides ransomni, Trichuris suis, Macracanthorhynchus hirudinaceus and Capillaria sp* were found predominant in female pigs than male pigs. Finding of the study was found in accordance with the reports of Tamboura et al. (2006). In this study, variation in occurrence of such helminthes in male and female animals might be due to the variation in sample size (Bachal et al., 2002), age immunity in boars (Urqhart et al., 1996), lower resistance of female animals or on the part of their reproductive events or temporary loss of acquired immunity near parturition (Garcia et al., 2007; Barger, 1993), stress, genetic resistance of host and insufficient/ imbalanced feed against needs (Raza et al., 2010; Hansen and Perry, 1993).

5. Conclusion

The study was performed aiming to determine the prevalence of gastrointestinal parasitic diseases in pig. The study revealed comparatively higher prevalence of *Ascaris suum, Macracanthorhynchus hirudinaceus* and Strongyloides *ransomni* in pig in relation to age and sex. The occurrence of gastrointestinal parasitic infection was higher in >6-12 months aged group and female pig. It is predicted that gastrointestinal parasitism were more might

be due to hot and humid climate which was ideally suitable for development of such parasites. However, poor management, insufficient diet, lack of awareness about deworming also enhances the high incidence of the infection. The study was limited study and due to time constrains topographical variation, seasonal pattern of the diseases as well as local and crossbred pig. Hence, it can be recommended further extensive investigation on gastrointestinal parasitism to overcome the limitation of the current studies which will assist to determine the important predictor related to such diseases**.**

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