

Prevalence of amphistome *Gastrothylax crumenifer* in Chittorgarh District of Southern Rajasthan, India

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(Received 6 February, 2021; accepted 17 March, 2021)

ABSTRACT

Present study found the main prevalence of amphistome *Gastrothylax crumenifer* infection in domestic ruminants like goats of the Chittorgarh district. The study was conducted in Chittorgarh district from January 2019 to December 2020. The 450 rumen of slaughtered goats from different slaughtered houses were examined, out of 450 goats, 375 goats were found infected highly with *Gastrothylax crumenifer* amphistome. The infection was also found throughout the year in different seasons, in summer at 31.11%, winter at 45.45% and maximum in monsoon 80.4%. Age-wise prevalence showed the highest infection in young goats and lowest in growing goats. The present investigation shows that the intensity or severity of infection of amphistome *G. crumenifer* which produces a paramphistomiasis in the goats. Infection of the amphistome parasite in goats leads to great economic losses by causing mortality in domestic ruminants.

Key words : Amphistome, *Gastrothylax crumenifer*, Goat, Paramphistomiasis.

Introduction

Paramphistomiasis is a parasitic infection of domestic ruminants caused by trematodes amphistome parasites. Paramphistomes are commonly known as rumen flukes which are digenetic parasites that require primary host ruminants like a goat, buffalo, cow, and sheep and secondary or intermediate host snail to complete their life cycle. Paramphistomiasis has been observed in cattle and sheeps caused by different species of amphistomes flukes such as *Paramphistomum explanatum*, *Paramphistomum cervi*, *Gastrothylax crumenifer*, *Cotylophoron cotylophorum* are cosmopolitan. Amphistomiasis is a widespread disease of ruminant which is found all around the world including India. Paramphistomiasis belongs to the superfamily paramphistomoidae which is distributed everywhere and is composed of hundreds of species belongs to 12 families. Its highest

prevalence has been reported in tropical and subtropical areas, mostly in Asia, Africa, Eastern Europe, Australia, Russia, New Zealand, etc. When immature, rumen flukes live in the small intestine and abdomen, from where flukes move into the rumen and become adults. The immature worms in the small intestine cause destruction of superficial glands, dilatation of the intestinal glands, diffuse infiltration of inflammatory cells, replacement of fibrin, hemorrhages and are responsible for polydipsia, severe diarrhea, anorexia, mortality and they cause severe gastrointestinal disease, low in production or even death of cattle (1978; Hanna *et al.*, 1988; Roife *et al.*, 1991; Mage *et al.*, 2002; Jones, 2005; Phiri *et al.*, 2007; Njoku-tony and Nwoko, 2009; Ozdal *et al.*, 2010; Siddiki *et al.*, 2010; Miller *et al.*, 2012; Mason *et al.*, 2012; Raja *et al.*, 2013; Swarnakar and Sanger 2014; Tehrani *et al.*, 2015; Jones *et al.*, 2017 and Nikpay *et al.*, 2019).

Incidence of amphistomiasis in cattle, buffaloes, sheep, goats have been reported in different states of India from time to time (Dutt, 1980; Hafeez and Rao, 1987; Varma *et al.*, 1989; Sahay *et al.*, 1989; Manna *et al.*, 1994; Tondon *et al.*, 2005; Hassan *et al.*, 2005; Sreedhar *et al.*, 2009; Gupta *et al.*, 2011 and Lone *et al.*, 2013; Chamuah *et al.*, 2017; Solanki *et al.*, 2020). In Rajasthan prevalence of trematode parasites has been observed in the southern part of the state (Swarnakar, 2007; Wadhawa *et al.*, 2011; Swarnakar and Kumawat 2013; Swarnakar *et al.*, 2014 and Swarnakar *et al.*, 2015). Due to parasitic infection causes economic losses to farmer's like's reduction of the quality of milk, meat and also reduces wool production. For the control of helminth infection, chemotherapy is a major treatment process. These chemotherapeutic anthelmintic drugs are far from satisfactory due to the absence of broad-spectrum activity of these drugs. Chemotherapeutic anthelmintic drugs or synthetic drugs which are recently used against rumen parasites have high cost as well as has side effects on cattle and due to high cost, these drugs make them unaffordable to poor farmers.

Materials and Methods

This study was carried out in goats from March 2019 to April 2020 in Chittorgarh (Rajasthan). A total of 450 goats were examined over this period. Slaughtered houses were visited regularly every month. The rumen and reticulum of slaughtered goats were collected monthly from the local meat market, Chittorgarh district (Rajasthan) to determine the seasonal prevalence of parasites and were checked for the presence of adult flukes. The infected part of rumen was brought to the laboratory and parasites were washed several times in the tap water and then transferred into 0.9% physiological saline, fixed in hot AFA (Alcohol 85 ml, formalin 10 ml, and acetic acid 5 ml) at 80 to 85°C for few seconds then pressed between two slides, left in cold AFA, bleached in chlorinated alcohol for 12 hours. Bleached amphistomes were washed in 70% alcohol, stained with alcoholic borax carmine for 5 minutes, dehydrated in alcoholic series, and cleared in clove oil for 12 hours, mounted in DPX on glass slides, and examined under a light microscope. The whole mounted parasites was identified based on their morphological characters as detailed by Dutt (1980).

Results

The observation of this study noted that the infection in goats with amphistome *Gastrothylax crumenifer* was more prevalent compared to the rest of the amphistome species in the rumen of goats of the Chittorgarh region. A relatively higher prevalence was recorded with *Gastrothylax crumenifer* (83.3%), followed by *Paramphistomum cervi* (72.2%), *Orthocoelium scolicoelium* (66.8%), *Cotylophoron cotylophorum* (64%) and other species (32%) also found. It can be said that the risk of being infected of goats with the species *Gastrothylax crumenifer* is higher than that of any other species of amphistomes (Table 1).

Table 1. The infection percentage of different species of amphistome in goats of Chittorgarh District.

Species Identified	No. of goats (n=450)	Prevalence (%)
<i>Paramphistomum cervi</i>	325	72.22
<i>Orthocoelium scolicoelium</i>	301	66.88
<i>Cotylophoron cotylophorum</i>	288	64
<i>Gastrothylax crumenifer</i>	375	83.33
Other species	144	32

The occurrence of infection of amphistome parasites in goats is not uniform throughout the year. The incidence of infection also fluctuates season-wise. The intensity and severity of infection of *G. crumenifer* in goats reach to its maximum in monsoon and rainy season (80.4%). Moderate infection was recorded in winter (45%) which was then followed by summer (31%). The monsoon season was the most conducive to the breeding of snails viz. *Lymnea*, *Indoplanorbis*, and *Gyranlus* species (Table 2). In Chittorgarh, the rainy season starts at ending of summer, at that time snails were reactivated and dispersed throughout the field and become infected with miracidium larva. The infection takes place early in the rainy season that is the reason; the mature amphistome parasite is prevalent in the monsoon.

In this study, age had a significant association with the prevalence of amphistomes. The highest prevalence (90%) was recorded in older goats (>24 months), followed by 85% in young goats (12-24 months) and the lowest 55.5% in growing goats of 6-12 months old (Table 3). There was an age limit in the prevalence of amphistomes and heavy infection

Table 2. Seasonal occurrence of *Gastrothylax crumenifer* in Goats of Chittorgarh District.

Season	No. of goat examined	No. of goat infected	Prevalence (%)
Summer (march- June)	90	28	31.11
Monsoon (July-Oct.)	250	201	80.4
Winter (Nov.-Feb.)	110	50	45.45
Total	450	279	

Table 3. Age wise prevalence of *Gastrothylax crumenifer* in goats of Chittorgarh District.

Age groups	No. of goats examined	Goats infected	Prevalence %
Growing goats (6-12 months)	45	25	55.5
Young goats (12-24 months)	60	51	85
Older goats (>24 months)	50	45	90

was occurs in goats more than 2 years of age. The reason for the prevalence of infection in goats in the different age groups is due to an immunological phenomenon. Besides, higher prevalence in old age group goats due to more exposure to the source of infection. A higher prevalence of *Gastrothylax crumenifer* was found in females (76.19 %) than males (71.42 %) (Table 4).

Table 4. Sex wise prevalence of *Gastrothylax crumenifer* in Goats in Chittorgarh district.

Sex	No. of goats examined	Goats infected	
		No.	%
Male	35	80	71.42
Female	105	105	76.19
Overall	140	105	73

Discussion

Paramphistomiasis is a disease caused by digenean trematodes belongs to the family Paramphistomiadae. Paramphistomiasis is one of the most pathogenic diseases among domestic animals or livestock and makes suffer heavy economic losses to the livestock industry annually. It has been estimated that domestic animal is at risk due to parasitic infection and rules over every corner of the world (Swarnakar *et al.*, 2015). This parasitic infection starts to initiate organ level damage and leading to the poor production of milk, meat, skin, and shows retarded growth as well (Njoku-ony and Nwoko, 2009). Goat is a dairy animal that is important for their animal protein and dried dung that is used as a fertilizer and fuel. Death due to

paramphistomes is very high and maybe as high as 89-90% in domestic ruminants

The incidence of *Gastrothylax crumenifer* in goat observed highest in the year 2019 to 2020 might be caused by higher climatological factors. The two most important factors influencing the incidence of *Gastrothylax crumenifer* are the temperature and moisture, affecting the hatching of *Gastrothylax crumenifer* ova, and the viability of encysting cercaria and the population of snail (Swarnakar *et al.*, 2014). When the data on the sex-wise occurrence of helminthes were analyzed, it was observed that a higher incidence occurred in the female than the male of infected domestic buffaloes (Siddiki *et al.*, 2010; Amin *et al.*, 2012; Swarnakar and Sanger, 2014). The present study also showed a higher prevalence of *Gastrothylax crumenifer* in females than male's goats. The higher percentage of infection in female goats as compared to male due to alteration in the physiological condition of the animals during pregnancy and lactation and also the lack of feed supplement for production due to this lead to decreases body resistance of the females. The geographical and climatic conditions also play role in such types of incidence as rainfall, temperature, and humidity, etc.

Dissimilarities found in sex-wise occurrence, Females of domestic ruminants were slightly lowered than males in Nigeria and Pakistan (Njoku-ony and Nwoko, 2009; Raza *et al.*, 2013). In this study, the appropriate information of incidence of *G. crumenifer* and other parasites existing infection along with seasonal trends and geographical distribution is highly essential and greatly infection found in goats among other domestic ruminants

(Iqbal *et al.*, 2004; Siddiki *et al.*, 2010 and Jones *et al.*, 2017). The observation of the present study indicates the infection of the *Gastrothylax crumenifer* parasite in goats is a major problem for the farmers of Chittorgarh. The study shows that amphistome *G. crumenifer* infection is dependent on seasons and age. The above knowledge on the prevalence of amphistome *G. crumenifer* parasites of goats gathered in Chittorgarh can be used to control severe problems of amphistomiasis.

The present study would help to improve the management and care of goats that also help in implements the socio-economic condition of the owner of goats and provide knowledge for understanding the infestation pattern of *Gastrothylax crumenifer* in goats of Chittorgarh district.

Conclusion

Gastrothylax crumenifer is an important amphistome parasite. The high level of *G. crumenifer* in goats in the present study shows the high rate of infection and economic losses to the farmers in the Chittorgarh region. Therefore, it is advised to farmers that they should improve feeds to their animals so that animals can have good health conditions so that some level of resistance confers against *G. crumenifer*. Besides, farmers should regularly treat animals with anthelmintic. To control *G. crumenifer* awareness should be created on the prevention.

Acknowledgment

Mr. Hitendra Singh Chouhan is grateful to CSIR New Delhi (File No. 09/172 (0107)2019-EMR I (Dated: 15.11.2019) for providing financial assistance to carry out the present research work and also thankful to Dr. Aparna Kumawat, associate professor, and Miss Hemlata Sen, research scholar, Department of Zoology, Government P.G. Meera Girls College, Udaipur for their valuable support.

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