VETERINARSKI ARHIV 78 (3), 243-251, 2008

Epidemiological studies of paramphistomosis in cattle

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KHAN, U. J., A. TANVEER, A. MAQBOOL, S. MASOOD: Epidemiological studies of paramphistomosis in cattle. Vet. arhiv 78, 243-251, 2008.

ABSTRACT

Epidemiological studies were undertaken at slaughter houses, live stock farms, veterinary hospitals and on household buffaloes under different management and climatic conditions in four different districts of the Punjab province. Infection rate was 7.83%, 12.33%, 7.17% and 4.25% respectively in the cattle at the slaughter house, live stock farm, veterinary hospital and at household cattle. Overall the highest prevalence in terms of season, 26% and 14.50%, was recorded during autumn at live stock farms and slaughtered cattle followed by 9.75% veterinary hospitals during summer and the lowest (2.5%) in household cattle was recorded during winter. It was observed that a higher infection rate was recorded in younger cattle (below two years of age) than older (above two years of age). Male cattle were more commonly affected than females. Snails belonging to genera *Bulinus, Lymnaea* and *Planorbis* were observed which are responsible for the transmission of paramphistomosis.

Key words: epidemiology, paramphistomosis, cattle

Introduction

Paramphistomosis is one of the most pathogenic diseases of domesticated animals, causing heavy losses to the livestock industry, amounting to several thousand crores of rupees annually. It has been estimated that more than 500 million cattle world wide are at risk due to parasitic infection. Death due to immature paramphistomes is very high and may be as high as 80-90% in domesticated ruminants (JUYAL et al., 2003; ILHA et al., 2005). *Paramphistomum cervi* is considered to be one of the most important species of paramphistomes since they are cattle parasites with cosmopolitan distribution. The harm caused by the infection in bovine affects production, since these parameters provide a lower nutritious conversion, a loss of mass and decrease in milk production which cause economic losses (ILHA et al., 2005).

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ISSN 0372-5480
Printed in Croatia

In Pakistan fresh water snails are of considerable medical and veterinary importance and found throughout the year (TANVEER and KHAN, 1989). The climatic conditions of Pakistan are favorable for the development and growth of fresh water snails. The incidence of the disease is increasing every year in Pakistan as more area is coming under water logging and salinity and also fresh water snails (intermediate hosts) are present in Pakistan, therefore they must be controlled.

Keeping in view the importance of disease, the present study was carried out to record the prevalence of paramphistomosis in cattle under different geo climatic conditions and also to observe which species of snail is responsible for the transmission of paramphistomosis in cattle.

Materials and methods

Prevalence of paramphistomosis in slaughtered animals. To record the prevalence of paramphistomosis in cattle, a survey of four slaughterhouses in Gujranwala, Sheikhopura, Lahore and Kasur was carried out at monthly intervals from November 2003 to October 2004. Postmortem examination of slaughter animals was carried out and the duodenum, rumen and reticulum were checked for the presence of young and adult flukes. Faecal samples of these animals were collected before slaughtering and were examined for the presence of eggs of paramphistome.

Paramphistomosis in live animals. For this purpose, survey of animals at livestock farms, veterinary hospitals and household animals in the districts of Gujranwala, Sheikhopura, Lahore and Kasur was carried out. During the study the month and season prevalence was recorded. For this purpose, the year was apportioned into 4 seasons, i.e., Spring (March-April), Summer (May-August), Autumn (September-October) and Winter (November-February). The prevalence in relation to age and sex was also noted.

Parasitological techniques. Fluke recovered from each of the infected animals during the survey were counted and morphologically identified as FOREYT (2001). Faecal samples were examined by direct smear, floatation and sedimentation techniques for the presence of fluke eggs (URQUHART et al., 2000). The counting of eggs was made by the McMaster egg counting technique (FOREYT, 2001). Paramphistomes eggs were identified on the basis of morphology (SOULSBY, 1982; FOREYT, 2001).

Meteorological data. Day to day information on maximum and minimum temperature, humidity, rainfall and pan evaporation was collected from the meteorological records of Lahore. The monthly averages for each weather factor were collected.

Results

During the one year study period from November, 2003 to October 2004 a total of 2400 cattle at slaughter houses and 7200 live cattle (2400 each at farm houses, veterinary

Table 1. Monthwise prevalence of paramphistomosis in cattle

Month	Slaughter house		Livestock farms		Vet. hospitals		House hold		Overall %	
	Nº affected / Nº examined	% age of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection		
Nov 2003	13/200	6.5%	13/200	6.5%	10/200	5%	6/200	3%	42/800	5.25%
Dec 2003	7/200	3.5%	10/200	5%	7/200	3.5%	6/200	3%	30/800	3.75%
Jan 2004	6/200	3%	11/200	5.5%	13/200	6.5%	7/200	3.5%	37/800	4.62%
Feb 2004	2/200	1%	3/200	1.5%	2/200	1%	1/200	0.5%	8/800	1%
Mar 2004	8/200	4%	12/200	6%	10/200	5%	6/200	3%	36/800	4.5%
Apr 2004	13/200	6.5%	20/200	10%	13/200	6.5%	15/200	7.5%	61/800	7.62%
May 2004	11/200	5.5%	12/200	6%	18/200	9%	13/200	6.5%	54/800	6.75%
Jun 2004	6/200	3%	5/200	2.5%	8/200	4%	4/200	2%	23/800	2.87%
Jul 2004	14/200	7%	19/200	9.50%	15/200	7.50%	8/200	4%	56/800	7%
Aug 2004	50/200	25%	87/200	43.50%	37/200	18.50%	14/200	7%	188/800	23.5%
Sep 2004	34/200	17%	67/200	33.50%	22/200	11%	13/200	6.5%	136/800	17%
Oct 2004	24/200	12%	37/200	18.50%	17/200	8.5%	9/200	4.5%	87/800	10.87%
Overall	188/2400	.83%	296/2400	12.33%	172/2400	7.17%	102/2400	4.25%	758/9600	7.89%

Table 2. Seasonwise prevalence of paramphistomosis in cattle

Season	Slaughter house		Livestock farms		Vet. hospitals		House hold		Overall %	
	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection		
Winter	28/800	3.50%	37/800	4.63%	32/800	4%	20/800	2.50%	117/3200	3.65%
Spring	21/400	5.25%	32/400	8%	23/400	5.75%	21/400	5.25%	97/1600	6.06%
Summer	81/800	10.13%	123/800	15.38%	78/800	9.75%	39/800	4.80%	321/3200	10.03%
Autumn	58/400	14.50%	104/400	26%	39/400	9.75%	22/400	5.5%	223/1600	13.93%

Table 3. Age and sex wise prevalence of paramphistomosis in cattle

Season		Slaughter house		Livestock farms		Vet. hospitals		House hold		Overall %	
		Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection	Nº affected / Nº examined	% of infection		
Age	Below 2 yrs	152/1733	8.77%	232/1765	13.14%	135/1742	7.75%	80/1732	4.62%	599/6972	8.59%
	Above 2 yrs	36/667	5.4%	64/635	10.08%	37/658	5.62%	22/668	3.29%	159/2628	6.05%
Sex	Male	116/1650	7.09%	137/850	16.12%	116/1725	6.72%	36/700	5.14%	405/4925	8.22%
	Female	72/750	9.60%	159/1550	10.26%	56/675	8.29%	66/1700	3.88%	353/4675	7.55%

hospitals and household) were examined for paramphistomosis. Of these 188 (7.83%) slaughtered, 296 (12.33%) at farms, 172 (7.17%) at veterinary hospitals and 102 (4.25%) at household, were affected with paramphistomosis. The overall infection rate was 7.89% (Table 1). It was evident from (Table 1) that the highest prevalence of paramphistomosis was recorded in slaughtered cattle and cattle at livestock farms during the month of August i.e., 25% and 43.50% followed by September (17% and 33.5%) whereas the lowest prevalence (1% and 1.5% respectively) was recorded during February. The highest prevalence in cattle at veterinary hospitals and households (i.e. 18.50% and 7.5%) was noted during the months of August and April respectively and the lowest prevalence (i.e 1% and 0.5%) respectively was recorded during the month of February (Table 1).

Among the slaughtered cattle and cattle at live stock farms, veterinary hospitals and household cattle the highest prevalence was recorded during autumn (i.e., 14.50%, 26%, 9.75% and 5.5%) and lowest (i.e., 3.50%, 4.63%, 4% and 2.50%) respectively recorded during winter (Table 2).

The occurrence of paramphistomosis was more frequently recorded in younger cattle (8.59%) than adult (6.05%) (Table 3). Analysis of disease pattern in male and female buffaloes revealed that no significant difference was observed. The prevalence was slightly higher in male buffaloes than in females. The prevalence was highest at live stock farms (16.12%) followed by slaughter houses (7.09%) then at veterinary hospitals (6.72%) while the lowest (5.14%) prevalence was recorded in household cattle (Table 3).

It was also noticed that the highest prevalence was recorded at Gujranwala followed by Sheikhupura then Lahore while the lowest at Kasur.

Prevalence in relation to meteorological factors indicated that there was a positive correlation of disease to minimum temperature, humidity and rainfall. Statistical analysis revealed a significant correlation between disease and rainfall. Snails belonging to genera *Bulinus, Lymnaea* and *Planorbis* were also observed which are responsible for the transmission of paramphistomosis.

Discussion

The occurrence of paramphistomosis in an area is influenced by a multifactorial system, which composes hosts, parasitic agents, transmission process and environmental effects. In natural foci of paramphistomosis, the parasites and their intermediate and final hosts form an association of potential epidemiological risk and it is important that the existence and localization of such an association should be recognized beforehand so that it can be brought under control.

In the present study, epidemiological data on paramphistomosis was collected in slaughtered and clinically ill cattle (at live stock farms, veterinary hospitals and

households) of the four districts of the Punjab province, Pakistan. When the data on seasonal incidence of paramphistomosis were analyzed, it was observed that a higher incidence of paramphistomosis occurred in the months of August, September and October in slaughtered cattle and in clinically ill animals. ABROUS et al. (1999), PFUKENYI et al. (2005b) and HARIDY et al. (2006) reported that the two most important factors influencing the incidence of paramphistomosis are the temperature and moisture, affecting the hatching of fluke ova, and the viability of encysting cercariae and the population of snails. They also emphasized that during the autumn season, the temperature and moisture are favorable for the rapid propagation of the parasitic life cycle.

In the present study, the majority of the slaughtered animals were harbouring mature flukes in their rumen and reticulum while in clinically ill animals the incidence of infection was based on identification of eggs in the faeces. Therefore, the recorded incidence of the infection was mainly due to mature parasites.

To complete the life cycle (from egg to egg) paramphistome requires, seventeen to eighteen weeks in summer and more than twenty weeks in winter in Pakistan, provided intermediate and final hosts are at liberty to pick up the parasite in its infective stage at the proper time.

It was also noted that the rainy season in Pakistan, starting during July and August, changes the environmental temperature and humidity so as to favour the emergence of cercariae from snails, due to this, metacercariae may show their existence in July, after ingestion which produces the paramphistomosis in animals. Metacercariae survive in herbage for up to twelve weeks depending on the environmental conditions. This assumption appears to be the reason for the high incidence of paramphistomosis during August - September (summer and autumn), when young animals become infected (GUPTA and SINGH, 1990; CHAUDHRI et al., 1993; DUTTA et al., 1995; KEYYU et al., 2005; OSNAS and LIVELY, 2006). It was observed that a higher incidence of paramphistomiasis occurred during autumn followed by summer and the lowest during spring. These findings are closely related to those of MISRA et al. (1997). An higher incidence (8.59%) of paramphistomosis in cattle was noted in younger animals (below two years of age) than above two years (6.05%). The recorded findings corroborate the opinion of MAGE et al. (2002) and KEYYU et al. (2006). Though the explicit cause of the high incidence of the disease in younger animals cannot be explained fully, it seems to be related to faulty management, poor nutrition and lower resistance due to environmental factors and increased incidence of disease. In the present study it was found that infection was slightly lower in females than males, the reason for which seems to be related to the social practice of keeping female under better management and feeding conditions in comparison to males, which are generally let loose to graze freely in pastures as was observed by MAGE et al. (2002). PFUKENYI et al. (2005b) found the same results.

Infection was highest at Gujranwala followed by Sheikhopura then Lahore while the lowest was at Kasur. This may be due to fact that a high level of infection was thought to be associated with the extension of the canal system providing additional areas of swamp and marsh where the cattle were exposed to infective larvae and metacercariae of helminths as was also noted by MISRA et al. (1997) and PFUKENYI et al. (2005b).

In the present study the highest prevalence was recorded at livestock farms, as was also noted by CHERUIVOT and WAMAE (1998) and CASSET (1989). Snails belonging to the genera *Bulinus*, *Lymnaea* and *Planorbis* were recorded in the present study. Similar genera were also recorded by RIMBAUD and DIANA (1991) and ABROUS et al. (1999). The incidence of infected snails was highest during the rainy season, as was also recorded by ROLFE et al. (1991), ABROUS et al. (2000) KUNITSKII (2000) and HARIDY et al. (2006).

Control of paramphistomosis may be achieved by removal of cattle from pasture or regular treatment during these periods. Strategic treatment during the dry season may reduce contamination of the snail habitat and infectivity of the pasture in the following wet season. Snails belonging to seven genera were observed in the present study. Of these Planorbis and Lymnaea were more common and are responsible for the transmission of paramphistomosis. Similar results were also reported by MAGE et al. (2002), CURTIS et al. (2004), and PFUKENYI et al. (2005a).

References

ABROUS, M., D. RONDELAUD, G. DREYFUSS, J. CABARET (1999): *Paramphistomum daubneyi* and *F. hepatica*: Influence of temperature changes on the shedding of cercariae from dually infected *Lymnaea truncatula*. Parasitol. Res. 85, 765-769.

ABROUS, M., D. RONDELAUD, G. DREYFUSS, J. CABARET (2000): A field study of natural infection in three fresh water snails with *Fasciola hepatica* and/or *Paramphistomum daubneyi* in central France. J. Helminthol. 74, 189-194.

CASSET, I. (1989): Enquete sur la paramphistomose bovine: recherché des parasites an abattoir. Rev. Med. Vet. (Toulouse) 140, 925-927.

CHAUDHRI, S. S., R. P. GUPTA, A. K. SANGWAN (1993): Helminthic diseases in ruminants of Haryana and their control a review. Agric Rev. Karnal. 14, 121-132.

CHERUIYOT, H. K., L. W. WAMAE (1998): Incidence of bovine paramphistomiasis in Kenya. Bulletin Anim. Heal. Production in Africa 36, 55-57.

CURTIS. H. K., A. C. JULIE, S. B. MELINDA, K. URIEL, F. S. ROBERT, H. O. JOHN, T. M. N. SADI, M. PETER, H. ORITH, H. C. P. JOSEP, M. M. ERIC, H. K. CHARLES (2004): Distribution patterns and cercarial shedding of *Bulinus nasutus* and other snails in the Msambweni area, coast province, Kenya. Am. J. Trop. Med. Hyg. 70, 449-456.

DUTTA, S., P. MAJUMDAR, D. K. BASAK (1995): Studies on the incidence of paramphistomiasis in cattle and buffaloes (Indigenous) in West Bengal. Indian. J. Vet. Med. 15, 84-86.

FOREYT, W. J. (2001): Veterinary Parasitology (Reference Manual) 5th Ed., Iowa State Press. pp: 69-113.

GUPTA, R. P., J. SINGH (1990): Prevalence of Paramphistomiasis in ruminants of Karnal & Ambala districts of Haryana. Haryana Agri. Univ. J. Res. 20, 6-7.

HARIDY, F. M., G. T. EL-SHERBINY. G. T, T. A. MORSAY (2006): Some parasitic flukes infecting farm animals in AL-Santa centre, Gharbia Governorate, Egypt. J. Egypt. Soc. Parasitol. 36, 259-264.

ILHA, M. R., A. P. LORETTI, A. C. REIS (2005): Wasting and mortality in beef cattle parasitized by *Eurytrema coelamaticum* in the state of Parana, southern Brazil. Vet. Parasitol. 133, 49-60.

JUYAL, P. D., K. KASUR, S. S. HASSAN, K. PARAMJIT (2003): Epidemiological status of paramphistomiasis in domestic ruminants in Punjab. J. Parasit. Dis. pp. 231-235.

KUNITSKII, V. N. (2000): Planorbinae snails obligate intermediate hosts of Paramphistomatid trematodes in central Polesye of Ukraine. Parasitologia 34, 345-348.

KEYYU, J. D., J. MONRAD, N. C. KYVSGAARD, A. A. KASSUKU (2005): Epidemiology of *Fasciola gigantica* and amphistomes in cattle on traditional, small scale dairy and large scale dairy farms in the southern highlands of Tanzania. Trop Anim. Health Prod. 37, 303-314.

KEYYU. J. D., A. A. KASSUKU, L. P. MSALILWA, J. MONRAD, N. C. KYVSGAARD (2006): Cross sectional prevalence of helminth infections in cattle on traditional, small scale and large scale dairy farms in Iringa district, Tanzania. Vet. Res. Commun. 30, 45-55.

MISRA, S. C., J. P. MISRA, D. N. PANDA (1997): Survey of intestinal helminthes in slaughtered buffaloes in Orissa. Indian. Vet. J. 74, 707-708.

MAGE, C., H. BOURGNE, J. M. TOULLIEU, D. RONDELAUD, G. DREYFUSS (2002): *Fasciola hepatica* and *Paramphistomum daubneyi*: changes in prevalences of natural infections in cattle and in *Lymnaea truncatula* from central France over the past 12 years. Vet. Res. 33, 439-447.

OSNAS, E. E., C. M. LIVELY (2006): Host ploidy, parasitism and immune defence in a coevolutionary snail trematode system. J. Evol. Bio. l. 19, 42-48.

PFUKENYI, D. M., J. MONRAD, S. MUKARATIRWA (2005a): Epidemiology and control of trematode infections in cattle in Zimbabwe: a review. J. S. Afr. Vet. Assoc 76, 9-17.

PFUKENYI, D. M., J. MONRAD, S. MUKARATIRWA, A. L. WILLINGHAM, D. J. MONRAD (2005b): Epidemiological studies of amphistome infection in cattle in the highvelved & lowvelved communal grazing areas of Zimbabwe. Onderstepoort J. Vet. Res. 72, 67-68.

RIMBAUD, E., V. DIANA (1991): Mortality in a herd of cattle associated with Paramphistomiasis. Veterinaria Argentinia 8, 606-612.

ROLFE, P. F., J. C. BORAY, P. NICHOLS, G. H. COLLINS (1991): Epidemiology of paramphistomiasis in cattle. International. J. Parasitol. 21, 813-819.

SOULSBY, E. J. L. (1982): Helminths, arthropod and protozoa of domesticated animal 7th ed. Iowa State University. Press Iowa University Press. pp. 64-71.

TANVEER, A., D. KHAN (1989): Seasonal variations in the environmental factors & snail population in four different habitats around Lahore. Punjab Univ. J. 3, 31-69.

URQUHART, G. M., J. ARMOUR, J. L. DUNCAN, A. M. DUNN, F. W. JENNINGS (2000): Veterinary Parasitology. Longman Scientific Technology. U. K. pp. 111-112.

Received: 9 September 2006
Accepted: 2 May 2008

KHAN, U. J., A.TANVEER, A. MAQBOOL, S. MASOOD: Epizootiološka istraživanja paramfistomoze u goveda. Vet. arhiv 78, 243-251, 2008.

SAŽETAK

Provedena su epizootiološka istraživanja paramfistomoze u goveda na klaonicama, farmama, veterinarskim klinikama i manjim gospodarstvima pod različitim uvjetima držanja i klime na području Punjaba. Invadiranost je istražena u četiri različite skupine goveda. Na klaonicama je pronađeno 7,83% invadiranih goveda, dok je na farmama taj broj bio nešto veći i iznosio je 12,33%. Među govedima na klinikama svega 7,17% životinja bilo je invadirano. Najmanji broj invadiranih goveda (4,25%) dokazan je u manjim gospodarstvima. U jesenjim mjesecima zabilježena je najveća učestalost u goveda s farmi (26%) i klaonica (14,50%). U goveda s klinika ljeti je dokazana učestalost od 9,75%. Najmanji broj invadiranih goveda dokazan je zimi u malim obiteljskim gospodarstvima (2,5%). Treba naglasiti da je najveća invadiranost zabilježena u goveda mlađih od 2 godine. Mužjaci su bili češće invadirani od ženki. Terenskim istraživanjima na istom području dokazani su posrednici, puževi iz rodova *Bulinus*, *Lymnaea* i *Planorbis*.

Ključne riječi: epizootiologija, paramfistomoza, govedo