

Research Article

Epidemiology of *Gigantocotyle explanatum* in naturally infected buffaloes

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Abstract

The *Gigantocotyle explanatum*, a digenetic trematode parasite infects the liver and bile duct of swamp buffaloes (*Bubalus bubalis*). The liver and bile duct of a total of 200 buffaloes were examined for the presence of *Gigantocotyle explanatum* by visiting local abattoirs of Rawalpindi and Islamabad, Pakistan. The histology of trematodes, collected from approximately 50 buffaloes, has been carried out for identification. The results of present study revealed 25 percent *Gigantocotyle explanatum* infection in central Punjab. The correlation between worm burden and area was found to be significant ($p > 0.041$) indicating the presence of trematode in all districts of study area with highest average worm burden 472.7 in Sargodha followed by 329 in Faisalabad. The correlation between worm burden and age was highly significant ($p < 0.05$) and correlation between worm burden and study area was also significant ($p < 0.05$). Furthermore it was found that buffaloes having 22 year age have the highest worm burden. It was concluded that the *Gigantocotyle explanatum* is prevalent in central Punjab. Several factors like good canal system that provide excellent habitat for its secondary host, snail and poor grazing management of animals being practiced in these areas should be managed to control the trematode infections.

Keywords: *Gigantocotyle explanatum*, Trematode, *Bubalus bubalis*, Bile duct, Prevalence.

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Introduction

In Pakistan various causes attributed to low productivity in livestock are due to unfavorable climate condition, low animal genetic potential, insufficient feed supplies and lack of proper health care facilities. Beside other factor secondary infection caused by trematode parasites is major contributing factor that decreases quality and quantity of animal product [1, 2]. The gastrointestinal tract (GIT) of animals harbor a variety of parasites particularly helminthes, which cause clinical and sub clinical parasitism. These parasites adversely affect the health status of animals and cause enormous economic losses to the livestock industry [3]. Cattle suffer from a wide variety of parasitic diseases of which immature paramphistomosis caused by kind of helminth is one of the most important [4]. *Gigantocotyle explanatum* is a very common digenetic trematode parasite affecting the domesticated animals usually present in the liver, bile duct and gallbladder. The adult parasite is non-pathogenic; however its immature forms inflict severe pathological infections [5].

The fresh water snails predominantly *Gyrulus convexiculus* serve as the intermediate host for *Gigantocotyle explanatum* [6]. Parasite present in the bile ducts of buffaloes form plugs on the luminal

surface by their acetabulum. Histopathological changes in the bile duct occur around the site of fluke attachment [5]. The effects of secondary infections caused by parasites are decrease in milk production, reduced product quality and quantity and increase mortality rate [1, 2].

Asian region raised 464 million cattle, 153 million buffaloes, 412 million sheep, 446 million goats, and 7080 million chickens [7], in which Pakistan has a population of 28.4 million heads of Nile Ravi and Kundi breed of buffaloes. Livestock provides sources of income for 45 percent of countries labor force and 60% of rural population [8]. The role of livestock in rural economy can be understood by the fact that 30 to 35 million of the total rural population is related directly or indirectly to the livestock, having household holdings of 2 to 3 cattle / buffalo and 5 to 6 sheep and goats per family, deriving 30 to 40 per cent of income from it [9]. However despite of economic importance very few systematic studies have been carried out on the prevalence and transmission in the buffaloes grazing in the Punjab, Pakistan. It was hypothesized that “the *Gigantocotyle explanatum* was prevalent in liver and bile duct of water buffaloes”.

Table 1: Correlation between age and average worm burden

Age of buffalo (Years)	Sex	Infection rate	Infected individuals	Coefficient of age	Correlation
16	Female	2.29%			
18	Female	17.2%			
20	Female	24%	25%	9.594	*highly significant (p<0.05)
22	Female	56.4%			

The epidemiological information from this study is helpful in the development of rational control measure against *Gigantocotyle explanatum* in water buffalos. The objective of the present study was: To determine epidemiology of *Gigantocotyle explanatum* based on its morphological character in the bile duct of infected water buffalos (*Bubalus bubalis*).

Materials and Methods

The present study was based on slaughter house examination of liver, bile duct and gall bladder of water buffalos brought for slaughtering from different districts of central Punjab including Pindi Bhattian, Sargodha, Gujarat, Mandi Bahuddin, Faisalabad, Jhelum and Chiniot. The livers and gall bladders of 200 animals from slaughter houses of Rawalpindi and Islamabad were screened to check the presence of *Gigantocotyle explanatum*. The questionnaire was developed to seek out information via age, sex, weight and origin of animals. The prevalence of parasite was determined by examining the liver of slaughtered animals. The liver/bile ducts parasitized with *Gigantocotyle explanatum* were collected, preserving in 70 percent alcohol and transported to Parasitology laboratory of PMAS Arid Agriculture University, Rawalpindi for further analysis.

For staining the parasite is removed from alcohol and placed in borax carmine solution followed by dehydration for three to four hours. Parasites then again washed with distilled water and pass through 30, 50, and 70 percent and with absolute alcohol for 15-30 minutes depending on size and thickness of the specimen. After dehydrations, the specimen was cleared in xylene and then permanent slide was prepared following the standard procedures [10] and these were identified [2].

The data obtained in this study was subjected to correlation and regression line to find the relation between worm burden, age and area by using SPSS version 16.0. Results were presented in the form of averages, percentages, graphs and tables.

Results and Discussion

The result of our study revealed that 50 buffaloes out of 200 buffaloes were found to be infected with digenetic trematode *Gigantocotyle explanatum*, showing 25% prevalence of this parasite (Table 1). Our results are in accordance with Ahmedullah *et al* as demonstrated 31.25% prevalence of *Gigantocotyle explanatum* in buffaloes in Bangladesh, which indicated relatively higher prevalence [11]. Mamun *et al.* reported 61.02% incidence of gastro intestinal helminth in Kurigram district of Bangladesh [12] and Azam *et al.* found 64.41% incidence of internal parasite in buffalo in Pakistan [13].

Adult amphisomes like *Explanatum* sp. have been found in the bile duct causing severe damage leading to fibrosis in the bile duct and liver [14]. *Explanatum* sp. is attached by their acetabulum in the liver and produces granulomatous nodules that are infiltrated by numerous inflammatory cells [11, 15].

From age related distribution, highest prevalence was found in buffaloes having age of 22 years (56.4%), followed by 20 years (24%), then 18 years (17.2%) and least was observed in 16 years buffaloes (2.29%). Highly significant correlation was found between worm burden and age indicating that the worm burden influenced by the age of animal. By applying the regression line it is concluded that as one unit change in age may increase 8.104 worm burdens on average. This shows that there is a correlation between worm burden and age. Our results are against Kumara and Hafeez who recorded higher prevalence in 1 to 3 year age group cattle [16].

Saha *et al.* 2013 reported highest prevalence of gastrointestinal helminthes in buffaloes of 3years to 6 years of age (40.19%), second most prevalence was found among buffaloes which are 7 years and above age (0-6 months of age (65%) and lowest prevalence 12.15%). Similarly, Mamun *et al.* reported highest prevalence of endoparasite in young buffaloes (>2-5 years) than adult in Kurigram district of Bangladesh [12] and Asif *et al.* also reported the higher prevalence of helminth in young than adult in Pakistan. The

awareness program on calf mortality due to ascariasis was done through deworming campaign by veterinarian and paravet staff in the study area may be the cause of lower prevalence at young ages [17]. Singh studied the morphology and morphometry of *G. explanatum* size range from 14.54-16.62mm in length and 5.77-6.69mm in width [14].

Highest infection rate was found to be 44.44% in Gujarat, followed by 33.33% in Pindi Bhatian and Chiniot, 23.25% in Sargodha, 19.35% in Jhelum and 18.60% in Mandibahudin. However least was reported in Faisalabad, 17.39% (Table 2). The correlation between worm burden and area was found to be significant with $p = 0.04$. Our results are in accordance with Saha et al. who described highest prevalence in Barisal sadar (44%) and lowest in Mehendigonj (25%) in Bangladesh [18]. Our findings are against Mamunet al. who reported highest prevalence in rainy season (71.17%) and lowest in winter season (57.27%) in Kurigram district of

Bangladesh. Though the seasonal prevalence rate is high, overall infection rate in buffalo of Kurigram district (61.02%) was higher than Barisal district (39.6%) [12]. Malik examined the *G. explanatum* prevalence in different regions of world and in developing countries *G. explanatum* infection considered as an important regional threat to animal production [5].

Areas in central Punjab which show high worm burden have some factors that help worms to establish successfully. These may include good canal system that provide excellent habitat for its secondary host, snail. There is a possibility that they are not provided with any medical treatment.

The prevalence and implications of the contrasting reproductive strategies in the bile-duct inhabiting species such as *G. explanatum* were studied with reference to the locations occupied by the adult worms and availability of the mollusk intermediate hosts [19].

Table 2: Frequency of *Gigantocotyle explanatum* and correlation of worm burden

Districts	No. of animals examined	No. of positive animals	Frequency of parasite (%age)	Average worm burden	Worm burden range	Correlation b/w area and worm burden
PB	27	9	33.33	133.7	12-342	p > 0.041 *significant
SGD	43	10	23.25	189.7	34-568	
GRT	18	8	44.44	92.1	12-263	
MBD	43	8	18.60	114.3	33-256	
FSD	23	4	17.39	329	174-563	
JHL	31	6	19.35	186.1	43-656	
CHN	15	5	33.33	57	22-99	

*PB (PindiBhattian), SGD (Sargodha), GRT (Gujrat), MBD (MandiBahauddin), FSD (Faisalabad), JHL (Jhelum), CHN (Chiniot)

All of the collected parasites were from the female buffalo as male buffalo are not sent to the abattoir but instead used for the reproductive or plough purposes. The females sent to the slaughter cells were mostly in their non-reproductive age. A variety of factors like age, sex and breed of the host, grazing habits, level of education and economic status of farmers, standard of management and anthelmintics use can influence the prevalence of helminthes [20].

Conclusion

Gigantocotyle explanatum is an important helminth and one of the major obstacles for livestock development in Pakistan causing remarkable direct and indirect losses at different parts of the country. The high level of *Gigantocotyle explanatum* in buffalos in the present study represent high rate of

infection and immense economic losses to the country. In line with this finding it is recommended that farmers who rear buffalos should improve provision of feeds to their animals so that the animal can have good body condition that confers some level of resistance against *Gigantocotyle explanatum*. Besides, they should be able to regularly treat their animals with the appropriate anthelmintics and awareness should be created on the prevention and control methods of *Gigantocotyle explanatum*. To make an effective control plan against gastrointestinal helminth a year round epidemiological study covering all the buffalo rearing areas of Punjab with proper diagnosis is warranted.

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