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Epidemiology of naturally occurring gastrointestinal helminthoses in buffalo of Coastal zone of West Bengal, India

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Abstract

The prevalence of naturally occurring gastrointestinal (GI) helminths and intensity of GI nematodes in buffaloes was determined in relation to season, age and sex of animal in the Coastal zone of West Bengal, India. Monthly 80 buffaloes were coprologically screened from four selected places of Coastal zone. The overall prevalence of GI helminth parasites was 51.45% with highest prevalence ($p < 0.05$) in monsoon (61.25%). Paramphistome (35.92%) was the predominant helminth parasite affecting buffaloes. The prevalence as well as intensity of GI helminths was significantly ($p < 0.05$) higher in calves compared to adult buffaloes. Strongyle and *Toxocara* infection were significantly ($p < 0.05$) higher in calves compared adult animals. The prevalence of GI helminths was non-significantly higher in female than the male buffaloes. The epidemiological observations of the present study might be exploited for strategic helminth control programme in buffaloes of Coastal zone of West Bengal, India.

Keywords: Gastrointestinal helminths, epidemiology, buffalo, coastal zone, West Bengal

Introduction

Buffalo plays a significant role in the agriculture based Indian economy by providing milk, meat, manure and draught power in the agricultural field. Though India has a high population of buffaloes but the farmers are not able to receive optimum profit due to various factors like disease problem, unscientific rearing practice and unawareness etc., of which, disease problem particularly gastrointestinal (GI) parasitism is the vital limiting factor [1, 2, 3]. Gastroenteritis due to different types of helminth parasites are the major constraints for profitable livestock production including dairy animals throughout the world [4]. Gastrointestinal tracts of animals including buffaloes are ideal habitats for various types of helminths causing clinical and subclinical infections. Gastrointestinal helminthoses in buffaloes cause severe economic losses due to reduced milk production, low fertility, decreased work capacity, treatment cost, reduced body weight gain in young animals and also increased susceptibility to other diseases [5, 6].

The hot and humid climatic condition of India including West Bengal are favourable for development, survival and translation of free-living stages of parasites [3]. Coastal zone of West Bengal mainly consists of two districts; Purba Medinipur and South 24 Parganas. The temperature and high rainfall and availability of large number of water bodies are conducive for the high prevalence of GI parasitic infections in animals in Coastal zone of West Bengal.

Epidemiological knowledge of parasitic infections is very important for adopting effective control measures to reduce the economic losses in animals. Various risk factors like season, age and sex of animals influence the prevalence of GI parasites in animals [7]. Systemic study on epidemiology of GI helminthoses in buffalo is scarce in West Bengal. Therefore, the present study was conducted to determine the prevalence of GI helminthoses in relation to season, age and sex of buffaloes in the Coastal zone of West Bengal, India.

Materials and Methods**Study area**

Coastal agroclimatic zone of West Bengal consists of Purba Medinipur and South 24 Parganas. The soils of the area are divided into three types; alluvial, sandy and saline soil. This zone experiences a high rainfall during monsoon. There are large number of ponds and channels of river in rural area of this zone.

The animals of this area graze mainly on the pasture surrounding the small water bodies in the agricultural field. Both the districts were considered for the study. Three Blocks namely Kakdwip, Joynagar I and Canning I under the district of South 24 Parganas and one Block, Contai I under the Purba Medinipur district were selected for the present study.

Selection of animals

Faecal samples were collected from one or two villages under each block and a total of 80 buffaloes were coprologically screened at every month. Buffaloes in the age group of 3 months and above of either sex were considered for coprological screening. The buffaloes aged from 3 months to 2 years old were considered as calves and in the age group above 2 years were considered as adults. Buffaloes in the selected places are maintained by intensive system in most of the time of the day and are allowed for grazing and wallowing in the ponds near the pasture area only for 1 – 2 hours a day. Routine deworming was not practiced and common grazing of adult and calves was practiced in those villages.

Collection of faecal sample

About 3 – 5 gms of faecal samples were collected from buffaloes aged 3 months and above. Per-rectal or freshly voided faecal samples of buffaloes were collected at monthly interval from the selected places. Faecal samples were collected in vials (Tarsons, India) containing 10% formalin. The date and place of collection and also the age and sex of animals were noted on the collection vial. The faecal samples were brought to the department for examination. The study was continued for a period of one year from April, 2016 to March, 2017.

Examination of faecal samples

A part of faecal samples were examined by standard sedimentation technique for detection of trematode eggs and also by standard salt floatation technique to detect nematode and cestode eggs^[8]. The faecal samples found positive for GI nematodes were examined quantitatively by modified McMaster technique^[8] to determine the intensity of GI nematode infection in terms eggs per gram (EPG) of faeces in buffalo of Coastal zone. The prevalence of GI helminths as well as the intensity of GI nematodes were determined in buffaloes of Coastal zone in relation to season, age and sex of the animals.

Statistical Analysis

The data on prevalence in terms of percentage for different parasites and for seasons were compared (Analyze-Compare Means). Then the data were analyzed separately i.e. between parasites and between seasons by Duncan method (One-way-ANOVA). The data were also compared between adult and calf and between male and female buffalo by One-way-ANOVA and the significance (p -value) was recorded at 5% ($p < 0.05$) level. The complete statistical analyses were done with the help of Statistical Package for Social Scientist (SPSS), Windows Version 15.0.

Results

Overall Prevalence

A total of 960 buffaloes were coprologically screened during the study period (April, 2016 to March, 2017). Out of 960 buffaloes, 494 were found positive for one or more species of GI helminth parasites. The species of GI helminths recorded were as Strongyle, *Strongyloides*, *Trichuris*, *Toxocara*, Paramphistomes, *Fasciola* and *Moniezia*. The overall prevalence of GI helminths was observed as 51.45% (Fig. 1). Paramphistomes (35.92%) was recorded as the predominant GI helminth of buffalo of Coastal zone of West Bengal. Strongyle group of nematodes were found as the GI nematode with an overall prevalence of 10.58%. Eggs of *Toxocara vitulorum* and *Fasciola* were observed in faecal samples of 4.08% and 5% buffaloes, respectively and only one cestode parasite, *Moniezia* species was recorded with an overall prevalence of 3.50% (Fig. 1).

Seasonal Prevalence

The prevalence of different types of helminths varied significantly ($p < 0.05$) among the three seasons of the year. Highest ($p < 0.05$) overall prevalence was recorded in monsoon (61.25%) followed by winter (51.25%) and lowest prevalence (41.75%) was observed in summer (Fig. 1). We found that the prevalence of Strongyle and Paramphistomes was significantly ($p < 0.05$) higher during monsoon compared to summer but there was no significant ($p > 0.05$) difference between monsoon and winter (Fig. 1). Significantly ($p < 0.05$) higher prevalence of *Toxocara* and *Strongyloides* sp. were observed in winter season compared to summer and non-significant difference was recorded with the monsoon season (Fig. 1). No seasonal variation was observed in the prevalence of *Fasciola*, *Trichuris* and *Moniezia* infection in buffalo of Coastal zone of West Bengal.

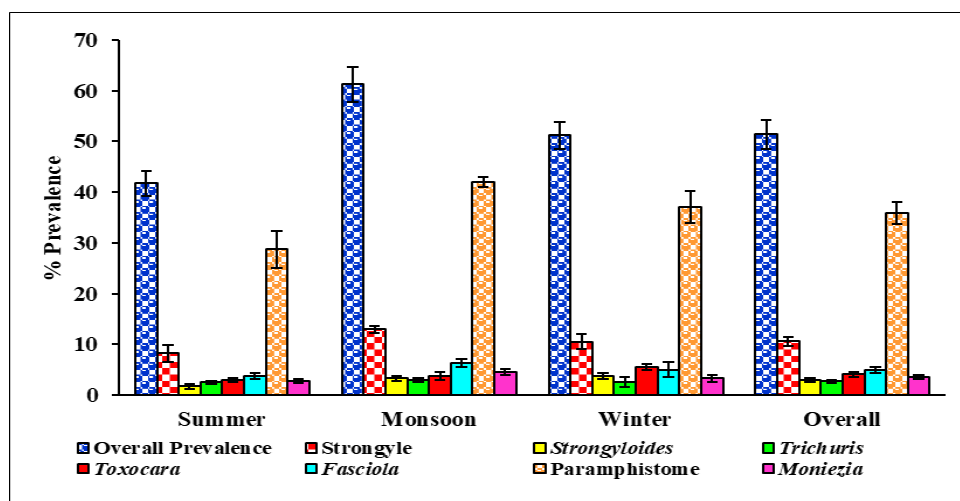


Fig 1: Overall and Seasonal Prevalence of GI helminths in buffalo of Coastal zone of West Bengal

Age-wise Prevalence

Age of buffalo showed significant effect on prevalence of naturally occurring GI helminths. The overall prevalence of GI helminth was significantly ($p < 0.05$) higher in calves compared to adult buffaloes all-round the year (Fig. 2). The

prevalence of Strongyle, *Toxocara*, *Strongyloides* and *Moniezia* were significantly ($p < 0.05$) higher in calves than the adult buffalo (Fig. 2). No significant difference was observed in prevalence of *Fasciola* and Paramphistomes between calves and adult buffaloes of Coastal zone of West Bengal.

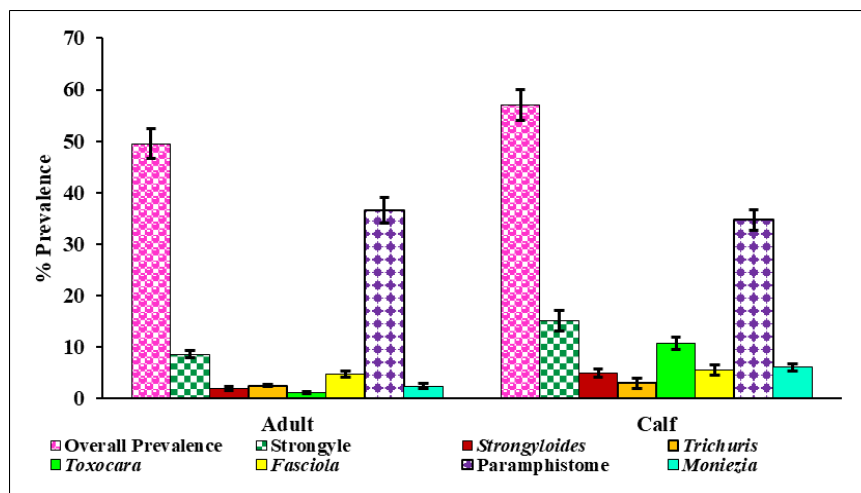


Fig 2: Prevalence of GI helminths in relation to age of buffalo in Coastal zone of West Bengal

Sex-wise Prevalence

In the present study sex of animals did not exhibit significant ($p > 0.05$) effect on prevalence of GI helminths in buffalo. Though the overall prevalence of GI helminth was higher in

female (53.57%) than the male (49.03%) but this difference was not significant ($p > 0.05$). The prevalence of Paramphistomes and Strongyle group of nematodes were also higher ($p > 0.05$) in female than the male (Fig. 3).

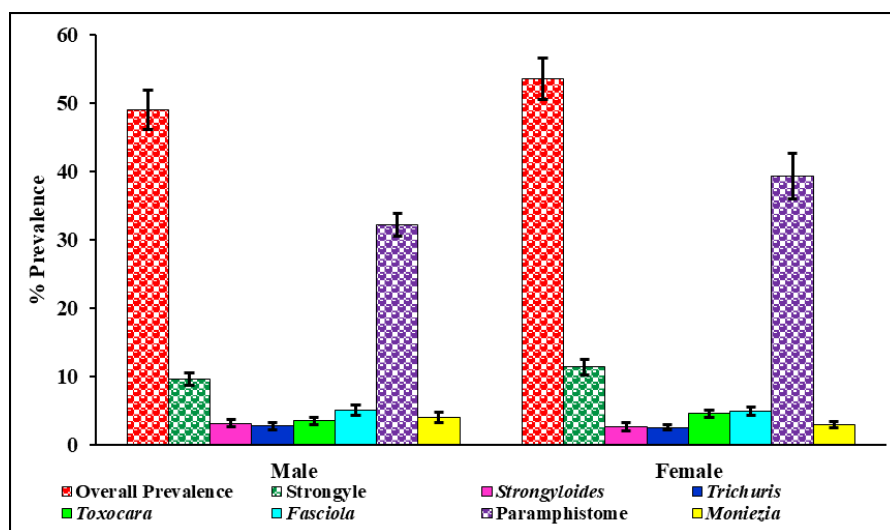


Fig 3: Prevalence of GI helminths in relation to sex of buffalo in Coastal zone of West Bengal

Intensity of GI nematode infection

The intensity of GI nematode infection was measured in terms of EPG. The highest intensity ($p < 0.05$) of Strongyle group of nematodes was observed in monsoon (272.5 ± 11.09) followed by summer (158.75 ± 23.13) and lowest in winter (137.5 ± 23.94) with an overall EPG of $189.58 (\pm 20.77)$ in buffaloes of Coastal zone. The intensity of GI nematodes was significantly ($p < 0.05$) higher in monsoon compared to other

two seasons. Overall intensity was significantly ($p < 0.05$) higher in calves compared to adult buffaloes. The calves showed significantly ($p < 0.05$) higher EPG on monsoon and winter compared to adult buffaloes of Coastal zone of West Bengal. No significant ($p > 0.05$) difference in intensity of GI nematode infection was observed between the male and female buffalo of Coastal zone of West Bengal (Fig. 4).

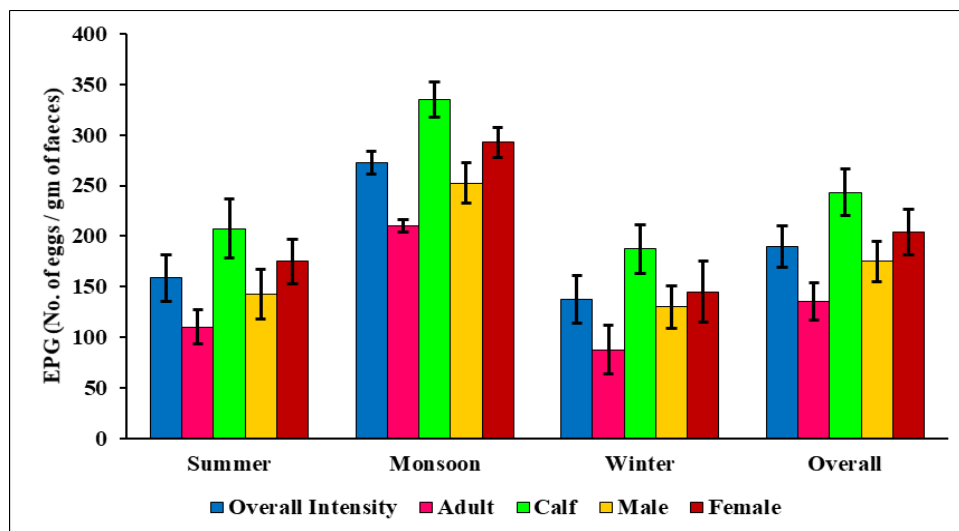


Fig 4: Overall and seasonal intensity of GI nematodes in relation to age and sex of buffalo in Coastal zone of West Bengal

Discussion

Gastrointestinal parasitism due to different types of helminths were of common occurrence in buffaloes of Coastal zone of West Bengal all-round the year. Gastrointestinal helminthoses is generally subclinical in nature and thereby it causes severe economic losses to the farmers. The overall prevalence of naturally occurring GI helminthoses was found to be 51.45% in buffaloes of Coastal zone of West Bengal. The prevalence of GI helminthoses has been reported to be varied from 13.18% to 64.67% in buffaloes from different parts of India [2, 9, 10, 11, 12]. Similar to our finding Nath *et al.* [2] and Shit *et al.* [11] reported 55.65% and 54.83% prevalence of GI parasites in buffaloes. The higher prevalence of GI helminths in buffaloes of Coastal zone of West Bengal might be due to the favourable climatic condition all-round the year for survival parasitic stages and also due to frequent exposure of animals to the contaminated pasture near the water-logged or marshy areas in the field. In contrast to our observations comparatively lower rate of prevalence of GI parasites has been recorded in buffaloes in India [9, 13]. On the other hand, Thakre *et al.* [10] and Patel *et al.* [12] observed higher prevalence of GI parasites compared to our observations in buffaloes of other state. The difference in prevalence of GI helminths from different parts of the country might be due to difference in agroclimatic condition, managerial practices and also due to number of animals included in the study.

Among the different types of helminths observed in buffaloes the prevalence of Paramphistomes was found to be highest followed by Strongyle group of nematodes. High prevalence of Paramphistomes in large ruminants of India including West Bengal has also been recorded earlier [3, 11, 14, 15]. The prevailing environmental condition of Coastal zone and the habits of buffalo to graze over swampy and water-logging pasture favours the development and translation of pre-parasitic stages of Paramphistomes and Strongyle nematodes and thereby resulting high occurrence of those infections.

Season-wise prevalence and intensity of GI helminths

Season played a crucial role in determining the occurrence of GI helminthoses in buffalo. Highest prevalence of GI helminths as well as intensity of GI nematode infection was observed during monsoon in buffaloes of Coastal zone of West Bengal. The average temperature, rainfall and relative humidity are optimum for development and survival of free-living stages of Strongyle nematodes and also the high rainfall

during monsoon are favourable for breeding of snail intermediate host of Paramphistomes. Grazing of animals on the water-logged pastures during rainy season might be responsible for high prevalence of GI parasites in buffaloes. High prevalence of naturally occurring GI helminths during monsoon has also been reported by many authors from the different parts of the country [3, 9, 10, 14, 15]. Lowest prevalence of GI helminths during summer [10, 11] as observed in the present study might be due to high temperature and low relative humidity and drying up off small water-bodies which are not favourable for survival of free-living stages of nematodes and snail intermediate host of trematodes.

Prevalence of GI helminths in relation to age and sex of buffalo

The prevalence as well as intensity of GI helminth infection was significantly ($p < 0.05$) higher in calves compared to adult buffalo in the study. The prevalence of Strongyle and *Toxocara* was significantly ($p < 0.05$) higher in calves during monsoon and winter, respectively compared to adult buffalo. The high prevalence of GI helminth in calves has also been recorded by many workers [12, 14, 16, 17] and high susceptibility to helminths in calves might be attributed to low resistance due to less exposure to different types of helminths [17] and also due to common grazing practices of adult and young animals in the study area. In contrast to our finding many authors reported higher prevalence of GI parasites in adult buffalo compared to young animals [9, 18]. This variation might be due to difference in agroclimatic conditions, grazing area, managerial practices and also due to exhausted immune system of adult buffaloes [18].

We observed slightly higher prevalence of GI helminths in female compared to male but this difference was not statistically significant ($p > 0.05$). Slightly higher prevalence in female animals has also been recorded earlier by Bhutto *et al.* [19]. The high prevalence in female buffaloes might be due to productive and reproductive stresses as stated by Raza *et al.* [6]. This finding was in contrast to the finding of many authors [17, 18] who reported significantly ($p < 0.05$) higher prevalence of GI helminths in female compared to male buffalo. This variation in observation might be due to the difference in agroclimatic condition and rearing practices of the study area and number and also the age of the female buffalo included in the study.

Conclusion

Our study demonstrated a high prevalence of naturally occurring GI helminth parasites in buffalo of Coastal zone of West Bengal. Season and age of animals played a significant role in prevalence of GI helminthoses in buffalo. The epidemiological data on GI helminthoses obtained in the present study could be utilized in formulating strategic treatment and control programme to reduce the economic losses in buffalo of Coastal zone of West Bengal, India.

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