Short Paper

Seasonal and monthly prevalence pattern of fasciolosis in buffaloes and its relation to some climatic factors in northeastern areas of Punjab, Pakistan

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Summary

A study was conducted in the northeastern areas of Punjab province (Pakistan) to analyse the monthly and seasonal pattern of fasciolosis in buffaloes and its relation to some climatic factors (temperature, humidity, rainfall and pan-evaporation) was also worked out. The faecal samples of buffaloes were collected from April 2003 to March 2005 on a monthly basis from randomly selected areas and analysed for the presence of *Fasciola* egg. From 7200 samples, 1058 (14.69%) were found positive. Seasonal data showed the highest prevalence and egg count (EPG) in autumn and the lowest in spring. Monthly results showed the highest prevalence in September (32.33%) and the lowest in May (4.83%), while mean EPG was highest in October (567 ± 95.5) and the lowest in June (3.2 ± 0.48). Statistically, significant difference ($P<0.05$) was noted within seasonal and monthly prevalences. Impact of humidity was found significant ($P<0.05$) on disease as compared to other climatic factors.

Key words: Fasciolosis, Prevalence, Meteorological factors, Buffaloes

Introduction

Fasciolosis, a disease of the bile duct of domestic herbivorous animals, contributes to great economic and health losses in the cattle industry in many countries worldwide (Attallah *et al*., 2002; Phiri *et al*., 2005; Ansari-Lari and Moazzeni, 2006; Cucher *et al*., 2006). Buffaloes provide a major portion of the total milk and meat production in many parts of the world including Pakistan. Fasciolosis is known to be prevalent in Punjab, a Province of Pakistan, especially in cattle and buffalo raising areas (Kendall, 1954; Kendall and Parfitt, 1965; Malik, 1984; Sheikh, 1984; Maqbool *et al*., 1994, 2002).

Climatic factors have been reported to determine the major periods of *Fasciola* transmission from many parts of the world (Ollerenshaw, 1971; Phiri *et al*., 2005). Microclimate can vary considerably from one region to another, from one farm to another or between neighbouring open grassland (Rangel-Ruiz *et al*., 1999).

Northeastern areas of Punjab, Pakistan are of national significance in that they are the major agricultural and cattle/buffalo rearing areas of Punjab. Keeping in mind the importance of these areas and the role of climatic factors, the present study aimed to determine: 1) the specific time period (month and season) in which infection is lowest and can be controlled easily, and 2) effect of climatic factors i.e., temperature, rainfall, humidity and pan-evaporation, on this parasitic disease, so that an effective strategy can be designed for its control.

Materials and Methods

Study design

To record the monthly and seasonal variations of fasciolosis in buffaloes, a total

of 7200 faecal samples were collected from randomly selected areas of Punjab. 10 g of faecal material was collected per rectum in sterile plastic jars, on a monthly basis (300 samples/month), from April 2003 to March 2005.

In Pakistan a year is divided into four seasons i.e., summer (May-Aug), autumn (Sep-Oct), winter (Nov-Feb), and spring (March-April), while Jul-Aug and Jan-Feb are also considered as rainy seasons. Seasonal data was tabulated according to this division.

Coprological examination

Samples were examined for the presence of *Fasciola* eggs by direct microscopic examination (wet mount) of faecal material (Urquhart *et al*., 2003). For each sample, three slides were prepared. Eggs were identified on the basis of morphology described by Soulsby (1982). McMaster egg counting technique (Urquhart *et al*., 2003) was used for fluke egg count (EPG) from positive samples.

Meteorological/climatic data

Meteorological data including maximum and minimum temperature (°C), relative humidity (%), rainfall (mm) and pan evaporation (mm) was obtained from the meteorological station, Lahore and their correlation with the occurrence of the disease was worked out.

Statistical analysis

Data was analysed statistically by computer software (Microsoft SPSS 10.0, USA). Monthly prevalence from each area was recorded and in the overall results the values of total no. of positive cases and prevalence (%) were expressed. Monthly and seasonal data was compared by Chi-square (χ^2) test and Mean number of fluke egg count (EPG) was compared by ANOVA (Tukey's-test). Effect of meteorological factors was analysed by Pearson's correlation. $P<0.05$ was considered significant at 95% confidence interval (C.I).

Results

Results of the present study are summarized in Table 1. Overall prevalence was noted 14.69% while mean EPG range was 3.2 ± 0.48 to 567 ± 95.5.

Seasonal prevalence

In seasonal pattern of fasciolosis, the highest infection and egg count was observed in autumn followed by winter, summer and the lowest in the spring season. Variations in seasonal prevalence and EPG was significant ($P<0.05$) as tested by ANOVA (Table 1).

Monthly prevalence

In monthly data, the overall highest prevalence was observed in September and EPG in October, which gradually decreased in December and again increased in January followed by a decline to the lowest infection in May and June. Statistical analysis revealed significant difference ($P<0.05$) in monthly prevalence and EPG (Table 1).

Relation between fasciolosis and climatic factors

Climatic factors studied for their effect on disease were temperature, relative humidity, rainfall and pan evaporation. Data showed non-significant correlation of disease with temperature, rainfall and pan evaporation, but a significantly ($P<0.05$) positive relation with humidity (Figs. 1a, b, c and d).

Discussion

Study of monthly and seasonal trends and influence of climatic factors are very important to know the epidemiology of a disease. In the present study, the monthly and seasonal pattern of fasciolosis and the effect of some climatic factors on these patterns were examined. Monthly trends showed the highest infection and mean abundance of eggs in September-October and the lowest in May-June. It was also observed when prevalence increases, egg count also increases, which indicated the increase in worm burden on infected host (buffalo). In July and August (rainy season), metacercariae can be found in considerable number on vegetation. Maybe buffaloes picked up the infection in these months,

which resulted in higher infection and worm burden in September-October. These results were in agreement with Maqbool *et al.* (2002) from Punjab province while Pfukenyi

Table 1: Overall prevalence of fasciolosis in buffaloes of Punjab in two years (from April 2003-March 2005)

Factors		No. of positive cases/total samples collected	Prevalence (%)	Mean egg counts (EPG ± S.E)
Time (months)	April	47/600	7.83	6.17 ± 1.08
	May	29/600	4.83	3.67 ± 0.8
	June	31/600	5.17	3.17 ± 0.48
	July	71/600	11.83	16.67 ± 3.33
	August	117/600	19.5	61.67 ± 9.5
	September	194/600	32.33	300 ± 85.6
	October	145/600	24.17	566.67 ± 95.5
	November	112/600	18.67	155 ± 47.7
	December	87/600	14.5	56.67 ± 16.3
	January	100/600	16.67	70.83 ± 31.8
	February	72/600	12.0	42.33 ± 17.1
	March	53/600	8.83	22.17 ± 8.48
Season	Spring	100/1200	8.33	14.2 ± 4.74
	Summer	248/2400	10.33	21.3 ± 5.51
	Autumn	339/1200	28.25	433 ± 73.2
	Winter	371/2400	15.46	81.2 ± 17.1
Overall		1058/7200	14.69	137.42 ± 25.14

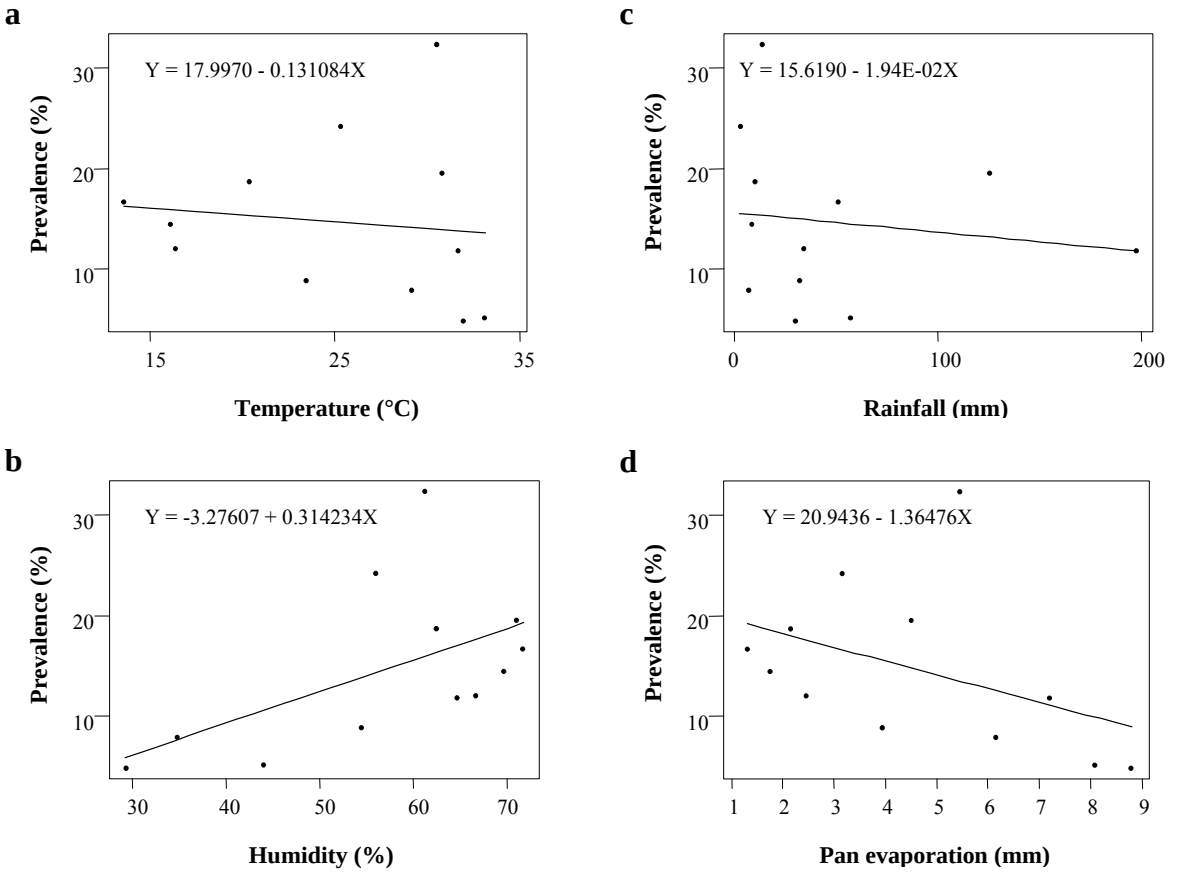

Fig. 1: Regression plots showing correlations of fasciolosis in buffaloes with: (a) Temperature (°C), (b) Humidity (%), (c) Rainfall (mm) and (d) Pan evaporation (mm)

et al. (2006) reported high intensity in August-September in Zambian cattle.

Seasonal data revealed significantly higher infection in autumn followed by winter, summer and lowest in spring. There was significant difference between infections of all seasons (ANOVA, $P<0.05$). Phiri *et al*. (2005) also reported significant difference in seasonal prevalence of bovine fasciolosis in Zambia. Maqbool *et al*. (1994, 2002) reported more or less similar seasonal prevalence in buffaloes and cattle as well.

Study of climatic factors showed that after heavy rainfall in July and August (253 mm and 108 mm, respectively) humidity increases, which results in risk of infection in September, indicating positive relation between infection and humidity (Maqbool *et al*., 2002). Lowest infection in May-June is related to progression of hot dry weather, as the temperature was high (up to 32°C) and humidity was low in these months. In January, prevalence increased again after rainfall when humidity increases, indicating a strong relation between humidity and the disease as reported by Yilma and Mesfin (2000), Maqbool *et al*. (2002), Phiri *et al*. (2005) and Pfukenyi *et al*. (2006).

This survey clearly indicated monthly and seasonal distribution of fasciolosis in buffaloes in northeastern areas of Punjab, Pakistan and its significant relation to relative humidity. It can be concluded from the study that fasciolosis can be controlled easily when infection is lowest i.e., in hot-dry conditions. This data can also be helpful to develop a control strategy for fasciolosis in other areas as well, with similar ecological and environmental conditions.

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