

Scientific Report

Prevalence of snails and *Schistosoma cercariae* and correlation with meteorological factors in Punjab, Pakistan

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Summary

Overall 10389 snails were collected from four study areas of Punjab from November 2005 to October 2006. The highest prevalence (38%) was found for *Indoplanorbis* followed by *Physa* (17%), *Bellamaya* (10.3%), *Gyraulus* (10%), *Lymnaea* (9.2%), *Oncomelania* (9%) and the lowest was found for *Bulinus* (6.7%). Only *Indoplanorbis* snails were found to be positive for *Schistosoma bovis* cercaria. Correlation between snails' infection and meteorological factors like relative humidity (%) and rainfall (mm) were significant ($P < 0.05$) while this correlation was not significant for temperature ($^{\circ}\text{C}$) and pan evaporation (mm).

Key words: Prevalence, Snails, *Schistosoma cercaria*, Punjab, Pakistan

Introduction

Different snails have been reported to be involved in the transmission of schistosomiasis in human and domestic animals in different areas of the world. The increase in the population of snails ultimately increased the prevalence of schistosomiasis (Zhou *et al.*, 2008). In Pakistan, Hussain *et al.* (1996) reported that snails are more important factors in transmission of parasitic diseases.

Control of snails is regarded as one of the best preventive measures in controlling schistosomiasis (Lardans and Dirsous, 1998). No work on *Schistosoma cercaria* in relation to snail's prevalence have been reported from Punjab, Pakistan.

The present study aimed to collect the snails from different areas of Punjab, Pakistan, and to analyse them for the occurrence of *Schistosoma cercaria*. This will help in taking preventive steps for the control of schistosomiasis.

Materials and Methods

During the present study, snails were collected, analysed for *Schistosoma cercaria* and then their occurrence was correlated with meteorological factors.

Study areas and snail's collection

Snails were collected from the areas adjacent to the River Ravi in Lahore, Bambawali-Ravi-Bedian (BRB) canal Lahore, Seepage water bodies of upper Chanab canal, Sheikhupura and upper Chanab canal, Gujranwala and Head Marala, Sialkot.

They were brought to the laboratory in glass jars covered with cotton plugs to allow aeration. Spinach leaves were provided as food in the laboratory and snails were kept at room temperature ($25.0 \pm 2.0^{\circ}\text{C}$) by following Tanveer and Khan (1989). They were examined for trematode infection by light exposure technique described by Malek (1984) and identified as genera level

according to Brown (1994). *Schistosoma cercariae* was examined on the basis of morphology.

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

Result and Discussion

Of the total 10389 snails collected, the genus *Indoplanorbis* was found to be significantly the highest (38%), followed by *Physa* (17%), *Bellamaya* (10.3%), *Gyrulus* (10%), *Lymnaea* (9.2%), *Oncomelania* (9%) and the lowest *Bulinus* (6.7%), (Fig. 1a).

Tanveer and Khan (1989) also reported the prevalence of snails from Punjab, Pakistan found in the present study except *Oncomelania*. Hussain *et al.* (1996), Maqbool *et al.* (1998) and Qureshi (2008) also reported the presence of these snails in Punjab with variable prevalence.

Overall area-wise prevalence was the highest (29.0%) in Lahore followed by Sheikhpura (26.1%), (23.6%) Gujranwala and the lowest in Sialkot (21.2%), (Fig. 1b). Qureshi (2008) also reported variable area-wise prevalence in Punjab, Pakistan.

In the month-wise data, overall prevalence of snails was observed to be the highest in August (13.9%) and the lowest in April (5.1%). Only July and August were found significantly higher ($P < 0.05$) than all other months (Fig. 1c). In overall season-wise data highest prevalence was observed in summer (42.1%) followed by winter

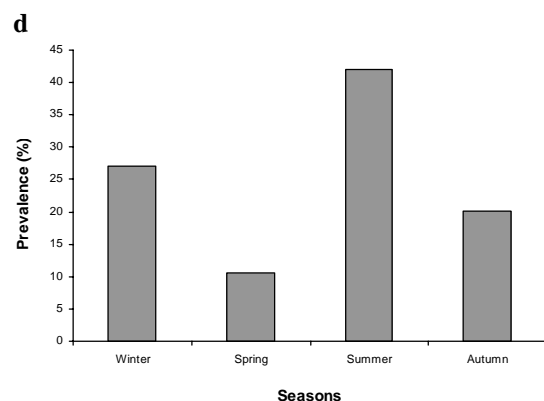
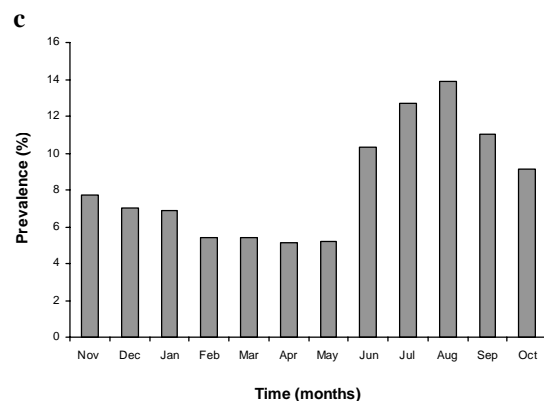
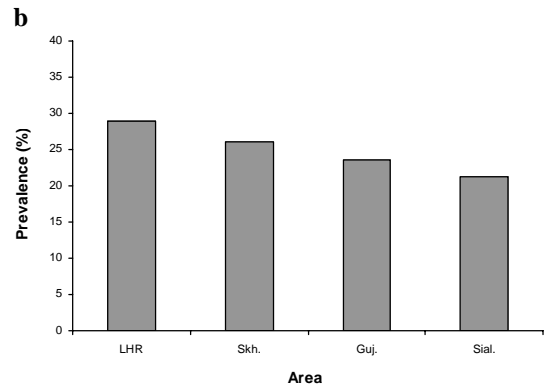
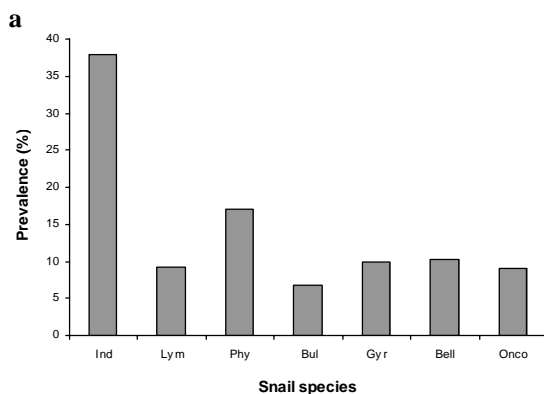


Fig. 1: Overall prevalence of snails: (a) genus-wise, (b) area-wise, (c) month-wise, and (d) season-wise in different study areas of Punjab from November 2005 to October 2006. Ind: *Indoplanorbis*, Phy: *Physa*, Lym: *Lymnaea*, Gyr: *Gyraulus*, Bel: *Bellamaya*, Onc: *Oncomelania*, and Bul: *Bulinu*. LHR: Lahore, Skh: Sheikhpura, Guj: Gujranwala, and Sial: Sialkot

(27%), autumn (20.2%) and lowest in spring (10.5%), (Fig. 1d). Maqbool *et al.* (1998), Khan *et al.* (2006), Qureshi (2008) also reported a similar pattern in month-wise and season-wise prevalence of snails.

Overall, 10389 snails of seven genera were collected and checked for presence of

cercariae. Almost all snails were infected with different trematodes *cercaria*. In collected snails, the *Indoplanorbis* was the only snail harbouring *Schistosoma cercariae* (13.4%). Overall area-wise infection of *Indoplanorbis* snails was highest in Lahore (17.0%) followed by Sheikhpura (14.6%), Gujranwala (12.1%) and lowest in Sialkot (9.47%).

In month-wise data overall infection in *Indoplanorbis* snails was highest in August (27.1%) and July (26.7%) and lowest in January and May (2.86%, 2.26%), ($P < 0.001$), (Fig. 2b). All areas showed highest infection in August, whereas the lowest was in January (Fig. 2a).

Overall season-wise prevalence of *Schistosoma cercariae* was found highest in autumn (17.6%) and summer (17.0%) followed by winter (10.0%), and lowest in spring (4.27%), ($P < 0.01$) in autumn and summer as compared to winter and spring (Fig. 2c).

It was noted from the data that snails *Indoplanorbis* showed highest infection (27.10%) in August when the average temperature dropped to 30.5°C, average relative humidity 73%, rainfall 145.7 mm and pan evaporation 4.0 mm (Fig. 3). Our results are supported by the results of Naeem (1998) who also reported presence of *Schistosoma bovis cercariae* in *Indoplanorbis* snails from Punjab, Pakistan.

Pearson's correlation between snails' infection and meteorological factors (temperature, relative humidity, rainfall) was found positive. Rainfall and humidity showed significant ($P < 0.05$), while pan evaporation showed non-significant negative correlation (Fig. 3).

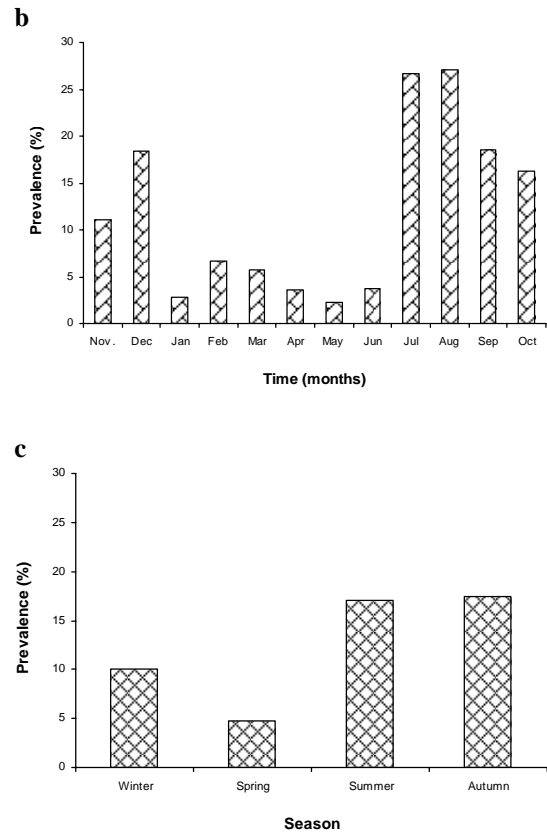
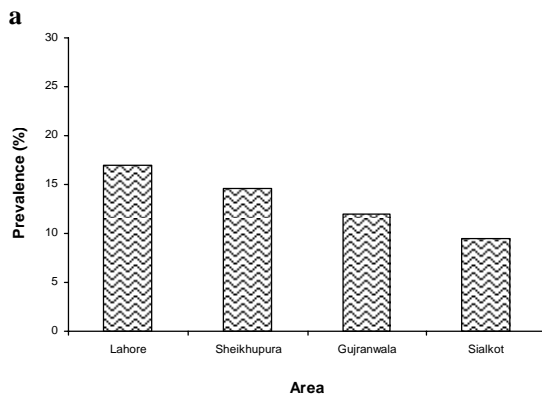


Fig. 2: Overall prevalence (%) of *Schistosoma cercaria* in *Indoplanorbis* snails: (a) area-wise, (b) month-wise, and (c) season-wise in Punjab from November 2005 to October 2006

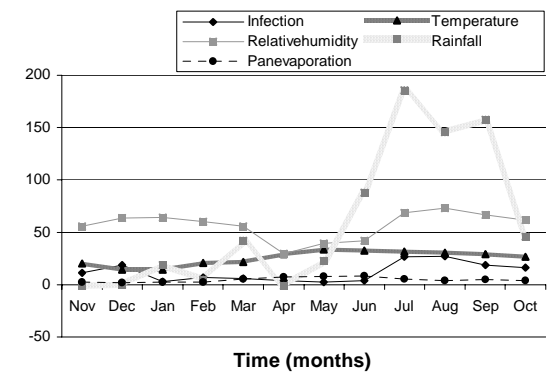


Fig. 3: Month-wise prevalence (%) of schistosomiasis in snails in relation to temperature (°C), relative humidity (%), rainfall (mm) and pan evaporation (mm)

This study shows the presence of *Schistosoma bovis cercariae* in Punjab, Pakistan and suggests that population control of snails is one of the best preventive measures in controlling schistosomiasis. In this way, we can make Punjab, Pakistan free from schistosomiasis.

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