PREVALENCE STUDIES OF PARASITE POMPHORHYNCHUS KASHMIRENSIS IN LOCAL FISH SPECIES SCHIZOTHORAX

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Abstract

Pomphorhynchus kashmirensis is an endoparasite of fish fauna especially that of *Schizothorax* species. Most often they cause gastrointestinal pathology which in severe cases can even lead to fish mortality. They have been extensively studied so far as their taxonomy is concerned but their ecology has received little attention. To find out the prevalence of *Pomphorhynchus kashmirensis* as it forms the basic stone towards its control measures. An annual occurrence of this parasite in different *Schizothorax sps of* The Dal Lake and The River Jhelum has been worked out. Investigation of *Pomphorhynchus kashmirensis* was carried out from December 2009 to November 2010. Three species of *Schizothorax* viz., *S. niger, S. esocinus, and S. curvifrons* were collected from two study sites- The Dal Lake and The River Jhelum. A total of 363 fish specimens of *Schizothorax* species were assessed and out of which 203 fishes were collected and examined from Dal Lake and 160 fishes were collected and examined from River Jhelum during the present study. On examining 363 fish specimens 94 were found to harbor the *Pomphorhynchus kashmirensis* parasite constituting an overall prevalence of 25.89%. Out of 203 specimens examined from the Dal Lake only 42 specimens were found infected with the *Pomphorhynchus kashmirensis* which constitutes the prevalence of 20.68%. Similarly out of 160 specimens examined from the River Jhelum only 52 specimens were infected with the

Pomphorhynchus kashmirensis which constitutes 32.5%. A seasonal cycle was witnessed with summer showing the highest prevalence of 39.622% (*S. niger*46.34%, *S. curvifrons* 31.11% and *S. esocinus* 30%) and least prevalence was found during the winter season 10.25%, Gender wise observations revealed that the sex wise differences were not much prominent but in most cases males 30.30% (*S. niger* 32.50%, *S. curvifrons* 27.65% and *S. esocinus* 28.94%) were found to be more infected than females 27.27% (*S. niger* 27.14%, *S. curvifrons* 36.61% and *S. esocinus* 15.78%) (*S. niger* 14.28 %, *S. curvifrons* 6.89% and *S. esocinus* 9.52%). The results show the dire need of the application of some suitable measures against these parasites so that our fish fauna are spared from them.

Keywords: *Pomphorhynchus kashmirensis, Schizothorax sps,* The Dal Lake, The River Jhelum, prevalence

Introduction

Pomphorhynchus kashmirensis is an important parasitic metazoan of fresh water fishes of Kashmir. It causes tremendous damage to the intestinal walls at the site of its attachment. The lamina propia gets thickened and goblet cells in this region become more prominent and their number also gets increased [43].They have been extensively studied so far as their taxonomy is concerned but before applying any highly specific techniques on them their control measures first need to study their epidemiology so that the preventive measures can be taken much before they infect our fish fauna. An annual occurrence of this parasite in different *Schizothorax sps of* The Dal Lake and The River Jhelum has been worked out.

Material and Methods

Study sites

Dal Lake is situated in Srinagar, the summer capital of the northernmost Indian state of Jammu and Kashmir. The urban lake, which is the second largest in the state, is integral to tourism and recreation in Kashmir and is nicknamed as the "Jewel in the crown of Kashmir" or "Srinagar's Jewel". The lake is also an important source for commercial operations in fishing.

The River Jhelum (Vyeth in Kashmiri, Vetesta in Sanskrit and Hydaspes in Greek) is the main waterway of the valley of Kashmir. It initiates from a beautiful spring called Verinag. This spring is situated at the foot of a spur of the Pir Panjal Mountain.

Collection of the hosts

Schizothorax fishes were collected at weekly intervals from Dal Lake and River Jhelum at different study sites with the help of a local fisherman. Study sites of Dal Lake include Nigeen, and Hazratbal. From River Jhelum fishes were collected from Chattabal and Rajbagh. The fishes were brought alive or fresh to the Parasitological Research laboratory I, P.G Department of Zoology, University of Kashmir, Srinagar.

Parasite collection

The fishes were examined for the endoparasites by killing them by the usual method of a blow on the head. Fishes were dissected & body cavity was thoroughly examined for any parasite. Intestines were placed in Petri dish containing normal saline (0.75% Nacl) to allow adhering parasites to be released from the lumen. In case of acanthocephalans, if the anterior end was deeply bored in the mucosa of the intestine, a few crystals of the methanol were added to the normal saline, containing the parasites adhered to the intestinal wall. This led to immobilization of the parasites & loosening of the grip on the intestinal wall & facilitated the detachment of proboscis in case of acanthocephalans without causing any distortion in the arrangement of hooks. The regular record of the collection was maintained and the prevalence of *Pomphorhynchus kashmirensis* was carried out by the following formula:

$$\textbf{Prevalence} = \frac{\textbf{Total number of hosts infected}}{\textbf{Total number of hosts examined}} \textbf{ X 100}$$

Prevalence is the percentile representation of infected hosts divided by hosts examined multiplied by 100.

Statistical Analysis

The whole data was fed into a Microsoft Excel 2010. A computer program (SPSS 10.05 for windows) was used for data analysis. Student's t-test was used for the analytical assessment. The differences were considered to be significant when the p-value obtained was less than 0.05.

Results and discussion

Prevalence of *Pomphorhynchus kashmirensis* in Dal Lake and River Jhelum:

Prevalence studies of *Pomphorhynchus kashmirensis* is the first step of the present research work. In fact it provides the basic foundation for any parasite control measures. A total of 363 fish specimens of *Schizothorax* species were collected and out of which 203 fishes were collected and examined from Dal Lake and 160 fishes were collected and examined from River Jhelum during the present study. On examining 363 fish specimens 94 were found to harbor the *Pomphorhynchus kashmirensis* parasite constituting an overall

prevalence of 25.89%. Out of 203 specimens examined from the Dal Lake only 42 specimens were found infected with the *Pomphorhynchus kashmirensis* which constitutes the prevalence of 20.68% Similarly out of 160 specimens examined from the River Jhelum only 52 specimens were infected with the *Pomphorhynchus kashmirensis* which constitutes 32.5% prevalence (Table 1). Infection patterns of Pomphorhynchus were greatly influenced by seasonal variance, fish species and type of water body. It was seen that overall prevalence *Pomphorhynchus* was low which is in accordance to the studies done by Spall and Summerfelt [39] and Chishti and Peerzada [15] who showed 0.7% and 9.3% infection of acanthocephalan parasites respectively. The low prevalence might be due to low availability or consumption of intermediate hosts. Seasonal variation in incidence of helminth parasitism in fishes was probably influenced by the annual life cycle of the parasites.

Also, *Pomphorhynchus kashmirensis* showed a wide host range and was successfully establishing in various species of Schizothorax. The highest prevalence was found in *S. niger* (30 %) (26.19% in Dal and 34.85% in Jhelum) followed by *S. curvifrons* (27.11 %) (19.11% in Dal and 38% in Jhelum) and least prevalence was found in *S. esocinus* (17.89%) (13.72% in Dal and 22.73% in Jhelum). The findings of the present results are in accordance with the studies of Ahmad *et al.,* [2] (Table: 1, Fig.1 and fig.2). However the overall prevalence of 25.89% can be attributed to various factors like temperature and availability of food. The host species generally shows a minimum preference for animal food [15] as they are mostly dependent on planktons (65-70%) which are the intermediate hosts for *P. kashmirensis*, the rest comprises of aquatic invertebrates. It is generally the amount of intake of intermediate host (which is an invertebrate) that determines the intensity of infection, so the present observation with lower prevalence of infection in *Pomphorhynchus kashmirensis* in its host is a consequence of the minimum quantity of animal food in their diet. Amin [7] also found a wide host range for *Pomphorhynchus bulbocoli* in Wisconsin fishes, which he attributed to similar feeding habits of the fish and also to the availability of intermediate host in the habitat.

Seasonal prevalence

The data pooled for seasonal estimation of *Pomphorhynchus* infection revealed definite seasonal prevalence of infection in all the three species of *Schizothorax,* with highest infection in summer and lowest in winter. There was a gradual increase in the prevalence rate from spring to summer and falls down with onset of autumn and least observed prevalence during winter season.

In summer the prevalence was 39.622% (*S. niger* 46.34%, *S. curvifrons* 31.11% and *S. esocinus* 30%) and the least prevalence was found during the winter season 10.25% (*S. niger* 14.28 %, *S. curvifrons* 6.89 % and *S. esocinus* 9.52%) (Table 2, Fig. 3 and Fig. 4).

This seasonal variance is quite evident that the highest incidence of *Pomphorhynchus kashmirensis* infection observed during summer and autumn months is attributed to the fact that temperature slowly starts rising above 20 oC which is favorable temperature for the larval development in the secondary host. This study is in full agreement with Cushing [16], Bisset [13], Amin [6], Andryuk [9], Gleason [20], Brown [14], Khan and Majidah[27], Tingbao and Xianghua [42], Mustafa and Altunel[32], and Rubio *et al*.,[37]. Majidah and Khan[29] reported the distribution pattern of the helminth populations in different fish hosts, which exhibited a regular seasonal trend and the infrapopulation concentration was relatively greater during summer. This pattern of infection does not conform the study done by various researchers like Chishti and Peerzada[15] who while working on seasonal occurrence of acanthocephalan infection in fishes of Wular Lake observed that the infection was higher in spring and low from summer in all fish host. Jha *et al., [23]* reported that acanthocephalan *Acanthosentis dalti* showed prevalence of 11.1-76% during different months and having highest incidence in the month of May. Yousuf and Pandit *[44]* and Nedeva *et al.,* [33] also reported an increase in infection rate in spring and decrease during summer/autumn months. Aloo [5] however, could not find any seasonality in parasitic infection of fish host.

Gender wise prevalence of *Pomphorhynchus kashmirensis*

After arranging the data, gender wise observations were made which revealed that the sex wise differences were not much prominent but in most cases males 30.30% (*S. niger* 32.50%, *S. curvifrons* 27.65% and *S. esocinus* 28.94%) were found to be more infected than females 27.27% (*S. niger* 27.14%, *S. curvifrons* 36.61% and *S. esocinus* 15.78%) (Table 3, Fig.5).This study is in full agreement with Machado *et al., [28]*. The influence of sex on the susceptibility of animals to infections could be attributed to genetic predisposition and differential susceptibility owing to hormonal control. It seemed that prevalence of infection by helminth parasites have no sex linked preference which is in accordance to the studies done by Chishti and Peerzada[15] who reported same infection in the both sexes.

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Table. 1: Prevalence of *Pomphorhynchus kashmirensis* in various host species

Host	Dal Lake				River Jhelum			*P - Value*
	No. examined	No. infected	Prevalence (%)	*P - Value*	No. examined	No. infected	Prevalence (%)	
S. niger	84	22	26.19	0.009	66	23	34.85	0.009
S. esocinus	51	7	13.72		44	10	22.73	
S. curvifrons	68	13	19.11		50	19	38.00	
Total	203	42	20.68		160	52	32.5	

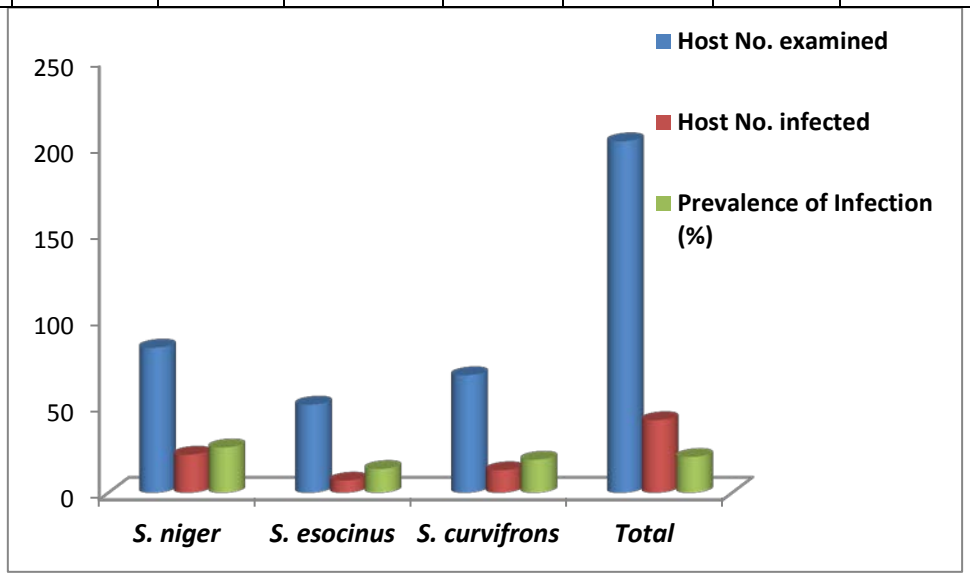

Fig.1: Prevalence of *Pomphorhynchus kashmirensis* in fishes of Dal Lake

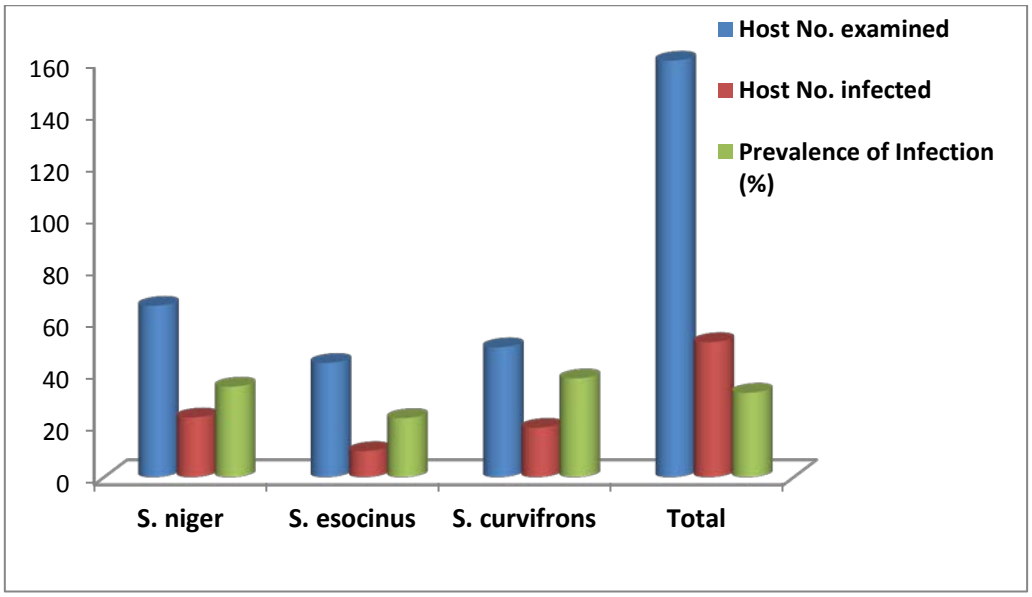

Figure: 2: Prevalence of *Pomphorhynchus kashmirensis* in fishes of River Jhelum

Table. 2: Seasonal prevalence of *Pomphorhynchus kashmirensis* in Dal Lake and River Jhelum

Season	**Host**	**Dal Lake**		**River Jhelum**		***P- Value***
		No. examined	**No. infected (%)**	**No. examined**	**No. infected (%)**	
Spring	*S. niger*	23	5(21.74)	16	5(31.25)	0.05
	S. esocinus	14	2(14.29)	9	2(22.22)	
	S. curvifrons	17	1(5.88)	9	3(33.33)	
Summer	*S. niger*	19	8(42.11)	22	11(50.00)	0.33
	S. esocinus	16	5(31.25)	14	4(28.57)	
	S. curvifrons	20	6(30.00)	15	8(53.33)	
Autumn	*S. niger*	22	6(27.27)	20	6(30.00)	0.11
	S. esocinus	10	2(20.00)	11	3(27.27)	
	S. curvifrons	13	3(23.08)	15	6(40.00)	
Winter	*S. niger*	20	3(15)	8	1(12.50)	0.32
	S. esocinus	11	1(9)	10	1(10.00)	
	S. curvifrons	18	0(0)	11	2(18.18)	
Total		203	42 (20.68)	160	52 (32.5)	

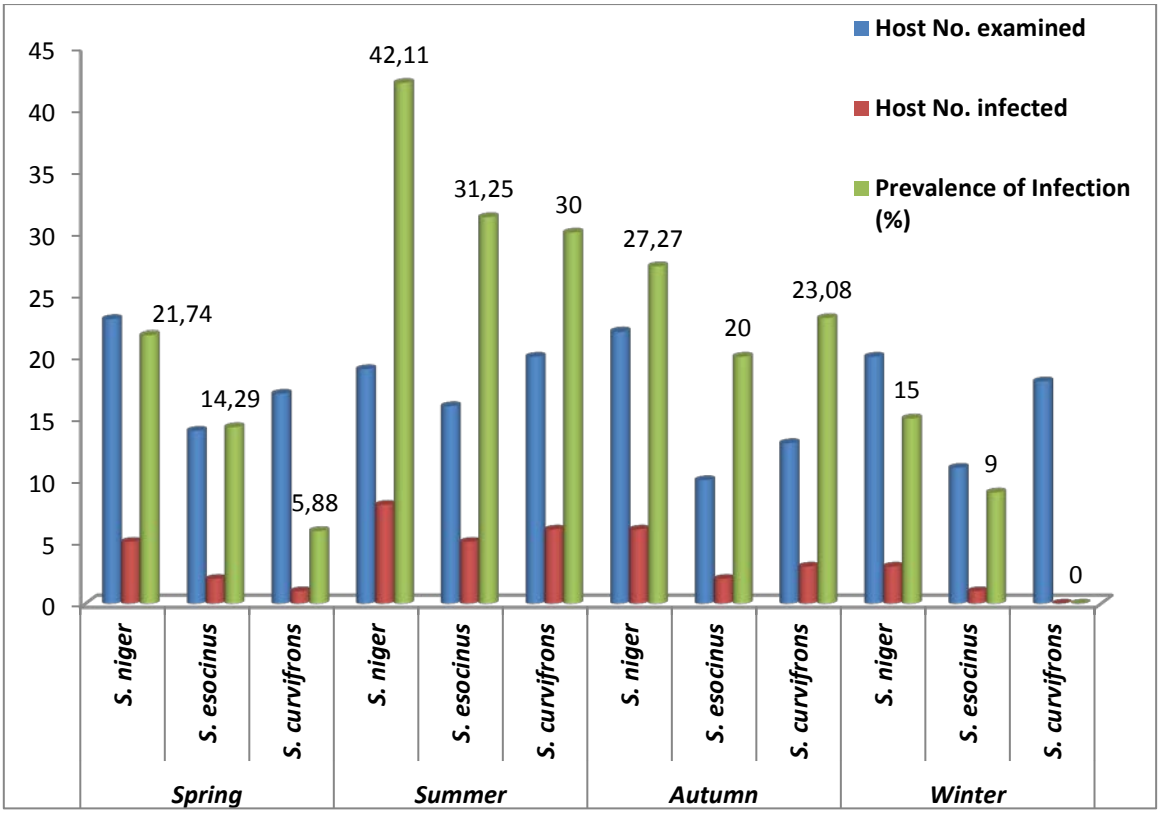

Fig.3: Seasonal prevalence of *Pomphorhynchus kashmirensis* in fishes of Dal Lake

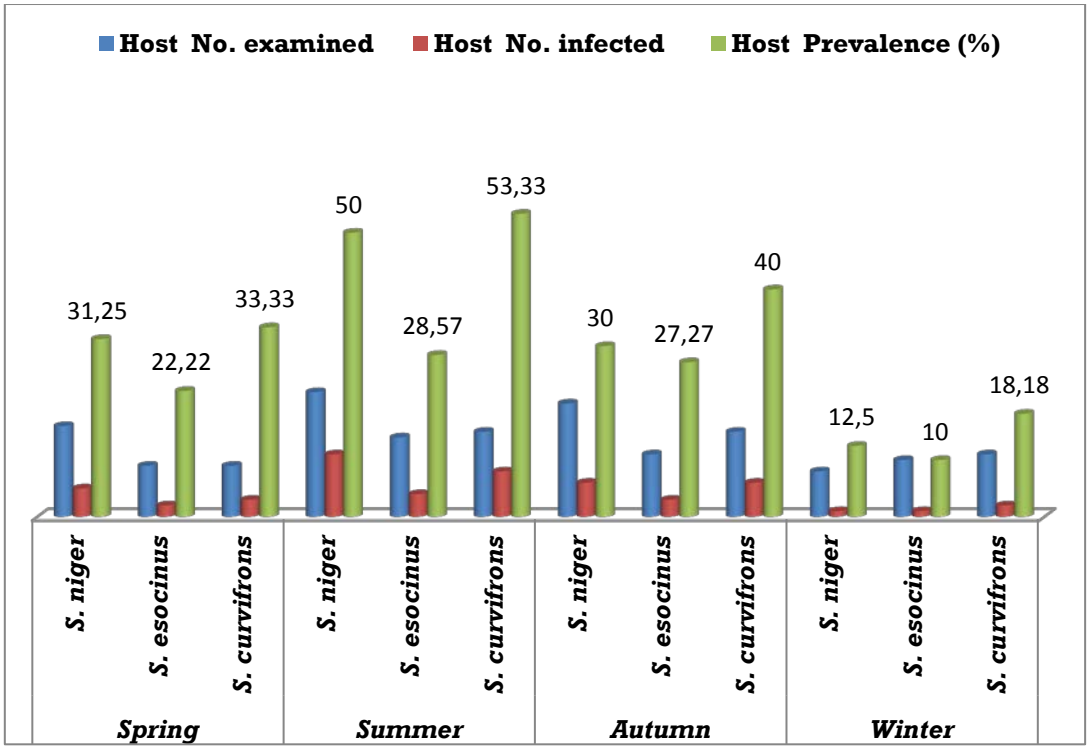

Fig.4: Seasonal prevalence of *Pomphorhynchus kashmirensis* in fishes of River Jhelum

Table. 3: Gender wise prevalence of *Pomphorhynchus kashmirensis*

Host	Gender	No. examined	No. Infected	Prevalence (%)	*P-value*
S. niger	**Male**	80	26	32.50	0.013
	Female	70	19	27.14	
S. esocinus	**Male**	38	11	28.94	0.05
	Female	57	9	15.78	
S. curvifrons	**Male**	47	13	27.65	0.10
	Female	71	26	36.61	
Total	**Male**	165	50	30.30	0.01
	Female	198	54	27.27	

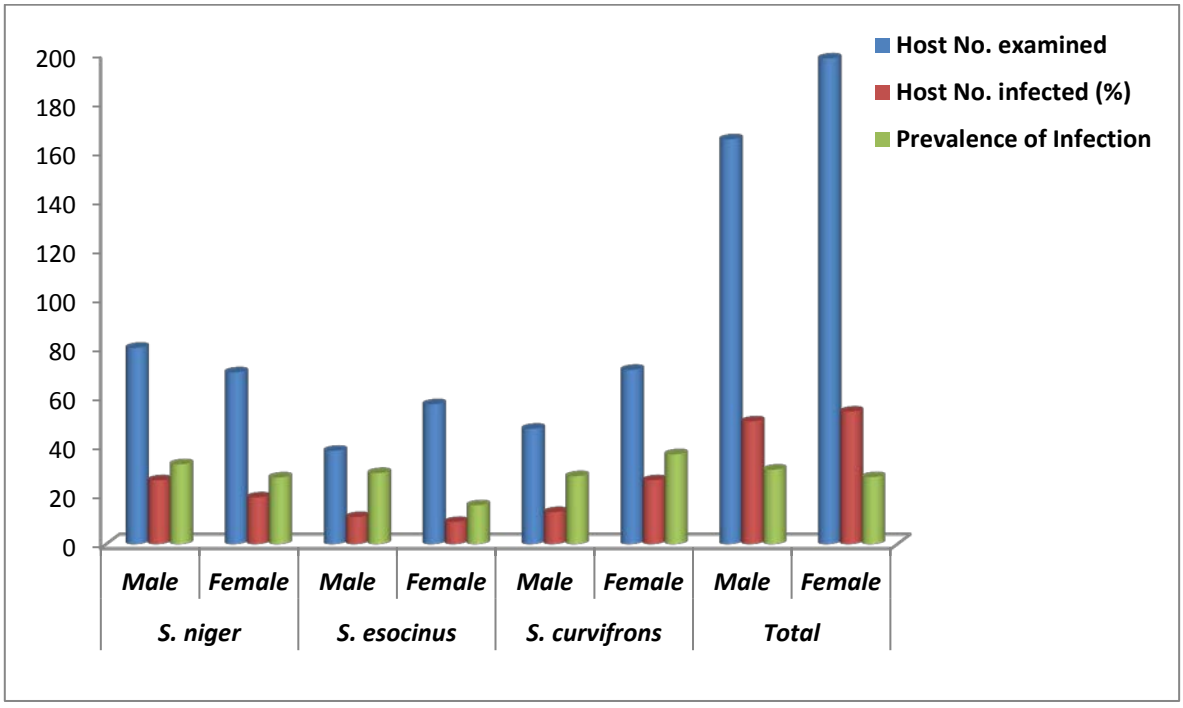

Fig.5: Gender wise prevalence of *Pomphorhynchus kashmirensis*