Schistosomiasis in Asian Elephants

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Introduction

Elephants are affected by many of the parasitic diseases in domestic animals. However, reports pertaining to parasitic diseases of elephants are scarce. Parasites act as biological irritants and compete with the hosts for nutrients. Schistosomiasis (also referred to as snail fever or bilharziasis) is caused by a type of trematode schistosomes (blood flukes) and is widely distributed among mammals and birds in Africa, Asia and South America.

There are about 100 different *Schistosoma* species recorded in different domestic and wild animals (Khalil 2002). Among these some have received particular attention, mainly because of their recognized veterinary significance *viz. Schistosoma bovis, S. spindale, S. indicum, S. nasale, S. incognitum, S. mattheei, S. curassoni, S. japonicum, Bivitellobilharzia* sp., *Orientobilharzia* sp. etc. (Chandrasekharan 1989; Modi 2001; Cherian & D'Souza2009; Devkota *et al*. 2014).

Schistosomiasis is an uncommon parasitic infection among Asian and African elephants and most of the time remains subclinical. In India, incidence of schistosomiasis were recorded in both free ranging and captive Asian elephants (*Elephas maximus*) from Assam, Kerala, Tamil Nadu, Madya Pradesh and other parts of the country (Chandrasekharan 1989; Modi 2001; Vimalraj e*t al*. 2012). However, little is known about the species of schistosomes affecting elephants. The occurrence of schistosomes in elephant liver was first reported by Mudaliar & Ramanajuchari (1945) and they named it as *Schistosoma nairi*. Subsequently Sundaram *et al*. (1972) and Islam (1994) reported occurrence of *Bivitellobilharzia nairi* in elephants of India.

The schistosome that parasitizes Asian elephants is *Bivitellobilharzia nairi* (Vimalraj *at al*. 2012) whereas *Bivitellobilharzia ioxodontae* parasitizes African elephants (Brant *et al*. 2013). These two schistosome species are closely related. Coprological and hemato-biochemical changes in schistosomiasis of Asian elephants and its successful treatment are being discussed here.

Methods

The four female Asian elephants Saraswati (32 years old, weighing 4800 kg), Nitya (22 years, 4100 kg), Champa (42 years, 5600 kg) and Anarkali (28 years, 4700 kg) of Rambo international circus camped at Bidar, Karnataka state were screened for the present study. It is mandatory for all circus companies to routinely check their animals' health and submit the animal health certificate issued by a veterinarian to the Central Zoo Authority of India, in New Delhi.

To study coprological and hemato-biochemical profile, faecal and blood samples were obtained from elephants after restraining by mahouts on lateral recumbancy. Ten ml of blood from an auricular vein and freshly voided faecal samples were collected for further examination.

The faecal samples were examined by direct, sedimentation and floatation techniques (Zinc Sulphate) as described by Soulsby (2005). Whole blood samples were analysed by using an automatic blood cell counter (ERMA) to obtain

the hematological profile. Serum samples were evaluated for biochemical profiles *viz*. calcium, phosphorus, total protein, albumin, glucose, SGPT and creatinine by using diagnostic kits (Swemed).

Results and discussion

During history taking, it was revealed that endoparasitic infections were recorded in these elephants earlier (six months back) and were treated with broad spectrum anthelmentics. Clinical examination revealed loss of appetite, dry skin and freshly voided fecal balls containing coarse material. Coprological examination by direct, sedimentation and floatation techniques revealed the presence of Schistosome ova (++), Strongyle ova (+) and Coccidian oocysts (+). The egg morphology (size, shape) was used to differentiate parasitic ova/oocyst as per the identification keys furnished by Soulsby (2005). The schistosome ova were identified as *Bivitellobilharzia nairi* based on its oval shape with a sharp spine on one end (Figs. 1 & 2).

B. nairi is a common schistosome of Asian elephants (Agrawal 2012). Adult worms of *B. nairi* are obligate parasites of the vascular system. They occupy the mesenteric blood vessels and portal veins, and migrate along the endothelium to reach the liver and spleen. Female worms produce numerous eggs (200 - 3000 per day), which are deposited in the circulation and exit the host by penetrating the gut and are excreted with faeces.

Strongyle ova and Coccidian oocysts were also observed in the elephant faeces indicating mild infection. Arunachalam *et al*. (2007) and Vanitha *et al*. (2011) recorded the prevalence of Strongyle sp. among Asian elephants in Tamil Nadu as 36% and 37% respectively.

The present study showed the elephants to possess low grade helminthic and protozoan infections which were far less significant than manifestion of overt clinical infection. Subclinical infections might not cause any immediate effects but in the long term may cause ill health. Therefore, even low grade infections should not be neglected.

The hemato-biochemical profile showed hematological changes such as a low degree of leucocytosis, lymphocytosis and increased PCV (Table 1) and biochemical changes such as increase in SGPT and decrease in glucose level (Table 2). Mixed parasitic infection and dehydration might have led to most of these changes. The increased SGPT may be due to migration of adult schistosomes causing damage to the liver parenchyma.

Recently Rajapakse *et al*. (2013) observed clinical features of *Bivitellobilharzia nairi* in elephants in Sri Lanka, such as emaciation, subventral oedema and anaemia. During post-mortem examination they found the liver was enlarged and adult schistosomes were found in the blood vessels of the liver parenchyma. The number of worms recovered from a portion of the liver was on an average 22 worms per 100 g liver.

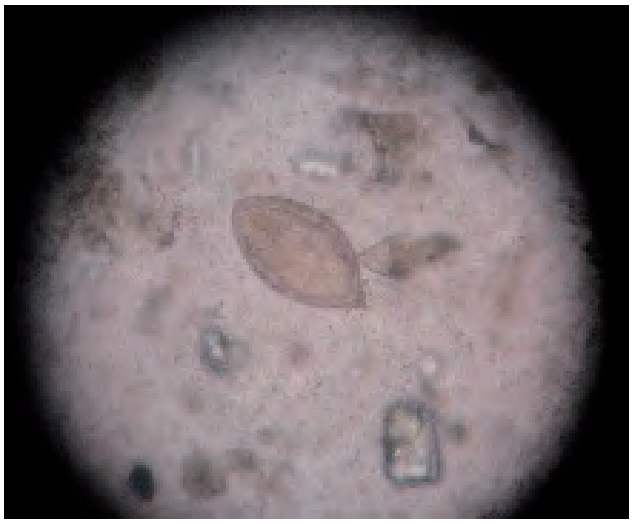

Figure 1. *Bivitellobilharzia nairi ova* (40x).

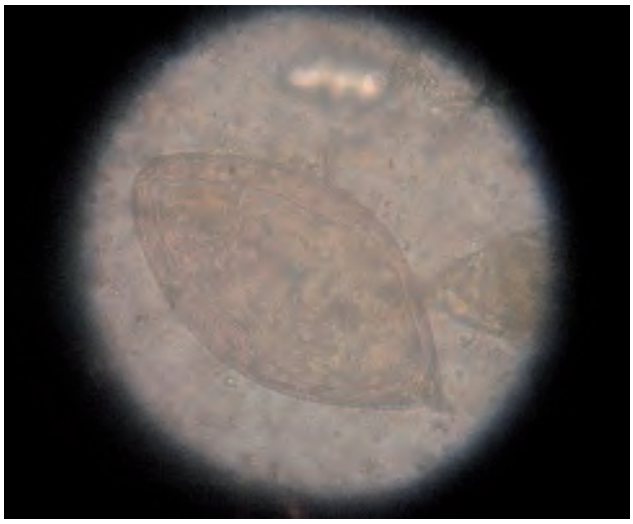

Figure 2. *Bivitellobilharzia nairi ova* (100x).

Table 1. Haematological profile of four schistosome (*Bivitellobilharzia nairi*) infected elephants.

Parameter	Sarswati	Nitya	Champa	Anarkali	Referral range
RBC (μl)	4.14 x 10^6	4.72 x 10^6	4.17 x 10^6	3.28 x 10^6	2.1 - 3.8 x 10^6
WBC (μl)	13.1 x 10^3	12.9 x 10^3	20 x 10^3	9.9 x 10^3	8.6 - 18.6 x 10^3
Neutrophils (%)	44	54	33	38	15 - 47
Lymphocytes (%)	44	38	57	49	18 - 50
Eosinophils (%)	4	0	2	5	2 - 8
Basophils (%)	0	0	0	0	1 - 3
Monocytes (%)	8	8	8	8	7 - 22
Hb (g/dl)	16.5	19.3	16.4	15.2	8.6 - 18.6
PCV (%)	58.6	62.9	57.9	53.6	27 - 48
MCV (fl)	141.5	133.2	138.8	163.4	111 - 138
MCH (pg)	39.8	40.8	39.3	46.3	-
MCHC (g/dl)	28.1	30.6	28.3	28.3	33.1 - 35.8
Platelet (μl)	231 x 10^3	161 x 10^3	294 x 10^3	173 x 10^3	200 - 600 x 10^3
MPV (fl)	8	8.6	7.8	8	-

In order to treat, a combination of fenbendazole and praziquantel (Fentas plus®) @ 2.5 mg/kg was administered orally (bread soaked in Fentas plus® liquid and given with jaggery) and monitored till complete recovery (Day‘0 ‘EPG=300, Day’ 7’ EPG= 100 and Day ‘15‘EPG= 000) and advised to repeat after 4 weeks. Praziquantel paralyses the adult worms but has no effect on eggs or immature worms. So repeat of treatment after 4 weeks is essential, to prevent recurrence (Agrawal 2012).

Acknowledgements

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Table 2. Biochemical profile of four schistosome (*Bivitellobilharzia nairi*) infected elephants.

Parameter	Sarswati	Nitya	Champa	Anarkali	Referral range
Ca (mg/dl)	12.05	11.79	11.97	11.99	12.50
P (mg/dl)	10.80	9.30	11.50	7.40	4.07
Total protein (g/dl)	6.33	5.48	5.22	6.38	6.0 - 7.5
Albumin (g/dl)	3.98	3.33	3.71	3.98	2.5 - 4.5
SGPT (units/l)	9.94	7.81	8.52	8.52	4.73
Glucose (mg/dl)	29.56	37.74	42.77	38.36	52.86
Creatinine (mg/dl)	0.93	0.93	1.53	1.44	1 - 1.8

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Elephants in the Mattala area in southern Sri Lanka
Photo by H.G. Nishantha