Gastrointestinal Helminths Of Cat (*Felis catus*) In Kashmir Valley, India.

Mohmad Muzafar Sheikh, Hidayatullah Tak, Mustahson F. Fazili.

Abstract: Coprological analysis was conducted during February, 2017 to January, 2019 to evaluate the prevalence of gastrointestinal helminths in stray cats of Kashmir valley, India. Fecal floatation and sedimentation technique revealed helminths in 349 scats out of 887 scats, with an overall prevalence of 39.43%. The study revealed four species of helminths in scats. Cats harboring one helminth were (6.31%), those harboring two were common (19.16%), than three (13.30%) or four (0.5%). The helminths observed and their respective frequencies detected were: *Toxocara cati* (26.49%), *Dipylidium caninum* (19.39%), *Spirometra* spp. (18.15%) and *Taenia* spp. (22.50%). *Toxocara cati*, a nematode with great zoonotic significance, was most common helminth found in scats of cat during the study. We observed significant seasonal variation (p<0.05) of prevalence in the gastrointestinal helminths, with high prevalence during summer followed by autumn, spring and least in winter. The high prevalence of zoonotic helminth species in stray cats in the Kashmir valley indicates that the risk of zoonotic infection may be high. This study will help veterinarians to plan preventative and diagnostic strategies with regard to pet animal intestinal parasites.

Key words: Helminth, cat, parasite, zoonoses, larval mirans, and epidemiology

1. INTRODUCTION

Animals are considered as main sources of emerging human and livestock pathogens [1] [2]. Zoonotic infections are responsible for over 60% of all human infectious disease worldover [3]. Some of the known zoonoses are caused by helminths, and are still prevalent in various parts of the earth [4]. Animals, particularly dogs and cats, act as reservoir hosts for several species of gastrointestinal helminths that can spread to humans due to their close association with humans. Cats and dogs have been reported to be infected with more than 60 zoonotic diseases of which helminths take on significant veterinary importance and public health globally [5] [6]. A wide variety of helminth parasites are found in cats, of which several species are of zoonotic importance [7, 8, 9]. Cats normally get infected by ingesting the eggs of helminths or by consuming infected paratenic host. Kittens can acquire infection of *Toxocara cati* through mothers uterus or through mother’s milk [10] [11] [12] [13]. The manifestation of clinical symptoms in cat depends on the helminth species, their abundance, the presence of concurrent multiple infections, and on the age and individual immunological status of the cat. Cats are the main source of broad spectrum of parasitic disease e.g. toxoplasmosis, giardiosis, visceral larval migrans syndrome (VLMS), ocular larval migrans syndrome (OLMS) in humans and other animals [14] [15]. Stray cats do not received veterinary attention and never, or rarely, receive anthelmintic treatments.

Cats that coexist with humans contaminate the public places by depositing feces containing eggs and helminth larvae of different species of zoonotic parasites, increasing the risk of zoonoses. Contamination of food sources and drinking water with cat feces may go undetected, resulting in the spread of disease. As a result, this becomes potential risk of infection for human beings, particularly for children due to their geophagia habit. Due to various factors, stray cats are more exposed to a higher infective parasitic pressure than other cat categories and pose an immense risk to human health [9]. Although cats are potential reservoirs of zoonotic helminths, little data exists on the, intensity, nature, and prevalence of their helminth infections. Database formation of such helminths is crucial for the control programs. Compared to other countries, few systematic studies of cat helminths have been reported from India [16] [17] [18] [19] [20] [21].The diversity and intensity of the disease are influenced by climatic, geographical, and economic factors [22]. It is necessary to evaluate the situation in every city. So far there is no report of helminths of cat from Kashmir. The present study was conducted to elucidate the status of intestinal helminth infections and seasonal variation of prevalence among cat in Kashmir valley, India.

2. METHODOLOGY

This study was conducted in Kashmir valley an important part of the Himalayan ecosystem, India. The Kashmir valley receives an average precipitation of 65cm, generally has temperate climate with four distinct seasons; winter (December-February), summer (June-August), autumn (September-November) and spring (March-May). The dominant flora is *Prunus avium*, *Salix alba*, *Quercus robur*, *Morus alba*, *Parrotiopsis jacquemontiana*, *Prunus persica*, *Pinus wallichiana*, *Populus alba*, etc. Fauna present is *Moschus chrysogaster*, *Ursus thibetanus*, *Lutra lutra*, *Felis chaus*, *Marmota caudate*, *Panthera pardus*, *Martes flavigula*, *Mustela sibirica* etc. [23]. Collection was done from different districts viz. Srinagar, Ganderbal, Baramula and Anantnag and Pulwama. The study was conducted from February 2017 to January 2019. The sample size was calculated using the formula given by Thrustfield [24].

---

* Mohmad Muzafar Sheikh, PhD Scholar, Department of Zoology, University of Kashmir, India, Ph +917006966283. E-mail: muzafar_sh23@yahoo.in
* Hidayatullah Tak, Assistant Professor, Department of Zoology, University of Kashmir, India.
* Mustahson F. Fazili, Assistant Professor, Department of Zoology, University of Kashmir, India.

---

314
Scats were collected from all study sites, intensively in areas where we located cats or cat sign. We collected fresh cat scats, identified by shape, color and size or the presence of cat tracks. Freshness was determined by sharpness of features and presence of moisture. Wearing a rubber glove, scats were handpicked. Each scat was stored in a zipped polythene bag, labeled with date and site of collection. Scats were preserved in 5% formalin, to inhibit hatching of eggs or larval development. Helminth eggs were recovered from scats by Sedimentation method of Charles and Josephine [25] and Floatation method of Charles and Josephine, and Soulsby [25] [26]. Eggs were observed under Microscope under 100x and 400x magnification. Measurements of eggs were carried out by ocular micrometer calibrated with stage micrometer. Eggs were identified following Soulsby [26].

3. STATISTICAL ANALYSIS
Frequency of helminth eggs present in scats was calculated by using the formula, FOI = (ni/N)x 100, where ni the number of positive scats and N was the total number of scats. Confidence limits were established with 95% confidence interval. The data was evaluated by Chi-Square test to calculate the impact of seasons on the variance of frequency; p-value less than 0.05 were considered significant. All the statistical procedures were carried out in SPSS 16.0 (SPSS Inc., Chicago, IL, USA).

4. RESULTS
The overall prevalence of gastrointestinal helminth infection in cats for a period of two years (2017-2018) was found to be 39.43% in 887 scats (Table 1). In 2017, total prevalence was 39.40%, compared to total prevalence of 39.29% in 2018 (Table 1), with no significant variance in prevalence (p>0.05). Four different species of helminths eggs were identified in cat scats viz. *Toxocara cati* (26.49%), *Dipylidium caninum* (19.39%), *Spirometra* spp. (18.15%) and *Taenia* spp. (22.54%) (Table 2). Scats were frequently infected with more than one helminth species. Cats infected with only one helminth species were 6.98%. Co-infection with two helminth species were 19.50%, with three helminth species were 12.62% and with four helminth species were 0.22% (Table 4). Year wise prevalence of helminths is given in Table 2. Comparison of prevalence between years was not statistically significant (p > 0.05). Seasonal wise, the current study showed variation in prevalence of individual helminths species between seasons, with maximum spread of infection in summer and least in winter. *Toxocara cati* showed highest prevalence during summer (36.51%), followed by autumn (30.90%), spring (23.22%) and least during winter (12.87%). *Spirometra* spp. showed highest prevalence during summer (26.97%), followed by autumn (18.45%), spring (16.58%), least during winter (8.91%). *Dipylidium caninum* showed highest prevalence during summer (29.46%), followed by autumn (20.60%), spring (16.11%), and least during winter (9.40%). *Taenia* spp. showed highest prevalence during summer (27.80%), followed by autumn (24.89%), spring (19.90%) and least during winter (13.87%) (Table 3). Comparison of prevalence between seasons showed statistically significant difference (p < 0.05), except for *Taenia* spp. (p>0.05).

5. DISCUSSION
The aim of this study was to examine stray cat scats in order to evaluate the prevalence of helminths with this population in Kashmir valley, India. During the study we observed eggs of four species of helminths in cat scats. The gastrointestinal helminths found in this study are in consistence with the gastrointestinal helminth fauna of cats worldwide. The overall prevalence of helminths in Kashmir valley was found to be 39.43%. The prevalence of gastrointestinal parasites in cats has been examined in several countries, with prevalence in range of 8.6-96% in the world [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37]. Among the helminths *Toxocara cati* 26.49% was most common helminth in scats of cat which is in accordance with the studies of Zinzani et al., and Villeneuve et al., [38], [39] who found *Toxocara* to be the most prevalent helminth in scats of cat. A similar prevalence of *Toxocara cati* (27.1%) was found in Germany [40], 33.1% in northern Italy [41], 20.3% in Romania [35], 32% Jammu [42]. Higher prevalence (55.2%) of *Toxocara cati* was found in Spain [28], 66.7% Greece [43]. Lower prevalence (5.4%) was reported in Finland [44]. *Toxocara cati* is considered for their immense public health significance in widespread and economically zoonoses [45]. Besides *Toxocara cati*, which is one of the most pathogenic species for cats, larvae and adults of different *Toxocara* species are involved in human infections. Larva migrans is the most common of them. In Kashmir valley, reliable epidemiological data about larva migrans in native population is scarce, but in a population-based study [46] found 32.86% of human to be seropositive for *Toxocara*. The high frequency of *Toxocara* spp. found in this study in stray cats, suggests that this condition could be more widely distributed than it is currently believed. However, the overlooking of these diseases by the population itself and by health care professionals [47] makes it difficult to evaluate the actual importance of larva migrans. High prevalence of *Toxocara cati* compared to other helminthes may be attributed to the transplacental and transmammary transmission to puppies [34]. Lack of anthelmintic treatments and highly relying on hunting of infected paratenic hosts may explain the high parasitism [40], [31]. Besides *Toxocara cati* other helminths of zoonotic importance were found. *Dipylidium caninum* prevalence was found in 19.39% of the scats of stray cats from Kashmir valley. A similar prevalence (20.7%) was reported in Spain by Calvete et al., [28]. Higher prevalence (39.6%) to that of our finding was reported from Greece [48]. Lower prevalence (0.2%) were reported in Romania [35], 1.2% in northern Italy [41], 2.9% in central Italy [37]. Although human dipylidiasis has been rarely reported, the parasite presents public health significance. Infections with this tapeworm may occur if fleas containing the infective cysticercoid stage are ingested by human [49]. *Taenia* spp. was found to be 22.54% of scats in the present study.
Lower prevalence (2.7%) of Taenia was reported in Romania [35], 8.4% in Greece [48]. Higher prevalence (37.5%) Taenia spp. was reported in Switzerland [50], 75.8% in Qatar [51] and 70.4% in India [52]. Taenia Taeniaeformis is the only species of Taenia typically reported from the domestic cat around the world [49]. In different countries various species of Taenia have been documented. The occurrence of Taenia spp. in cats indicates the definitive hosts may acquire infection by scavenging infected domestic herbivorous, principally ovine carcasses. Infection with some Taenia spp., particularly T. multiceps, in intermediate hosts such as ovine’s, is significant, causing immense economic losses. These species have also been documented to have zoonotic importance, with several human cases recorded worldwide [53]. Their identification was not possible to the species level through coprological examinations. Spirometra spp. was also recorded in cats. Although not many studies had documented Spirometra spp., similar observation has been reported in a survey undertaken among dogs population in India [54]. The presence of Spirometra spp. is a reflection of the fact that cats roam freely and had access to paratenic hosts as their food sources. The possible source of infection cats is via ingestion of raw frog or fowl and therefore acting as important indirect reservoirs of this parasite to human. Spirometra spp., is the most important cestode, causing human sparganosis [55]. Infection in humans occurs through eating undercooked or raw meat of infected animals, water contaminated with infected cyclops, or by consuming snake flesh or frog in traditional medical practices [56]. The possible reasons for the wide range of prevalence among the gastrointestinal helminth in different parts of the world might be the factors like geographic region (temperature and humidity), the presence or absence of intermediate host of the corresponding parasite in study area, sampling protocols, coprological method used, population of cat (stray or sheltered) demographic factors, and anthelmintic usage which were also given as the possible justifications by Mundim et al., [57]; Katagiri and oliveira-Sequeira [58]. It was observed that the prevalence was high during summer and low during winter, a similar trend in prevalence between seasonal was observed by Coggins [59] and Abdel Aziz et al., [60], this variation in prevalence between seasons may be due to optimal climatic factors present during summer for embryonic development of nematode eggs and presence or absence of intermediate hosts during seasons. Cold winters probably contribute to low egg viability and low survival of larvae. El-Seify et al., [61] showed seasonal trend in the prevalence of Ctenocephalides spp. in Alexandria, with 100% prevalence in summer 95% prevalence in autumn, 80% prevalence in spring and 50% prevalence in winter, which could explain the seasonal trend in the prevalence of Dipylidium caninum. In most developed regions, human developmental indicators as well as the veterinary services available to cats reduce the infection rates. However, in developing nations like India, the weak infrastructure is similar to that found in poor countries of Africa, Asia and Latin America, where services of municipality and veterinary are weak increasing the infection rate. The growing popularity of cats as pet, geophagia by children, and the close physical contact between owner and pet are given as a risk factor of transmission [34, 62]. We found most of the samples infected with two or three helminths. Various studies [63], [64] have reported co-infection with helminths. Rodents and birds act as paratenic host for Toxocara canis, Taenia spp. Co-infection with these helminths could be because rodents and birds are important food items of cats.

6. CONCLUSION

The present study showed that GIT helminths infection of zoonotic importance extensively distributed in stray cats throughout the study area. Consequently, the current high prevalence of pet GIT helminthes along the lack of awareness by the society makes the necessity to take the appropriate control and prevention measures. Monitoring presence of parasites in cats should be a continuous task due to the risk of zoonotic infections and the potential impact on public health A consistent programme of sanitary education must be included in public health programme as a first step for the control of intestinal parasites in cats. Finally, veterinary schools should emphasize the education in common people as a means to prevent or minimize zoonotic disease transmissions. Alternatively, population control of cats together with public health education should be implemented.

ACKNOWLEDGMENTS

We acknowledge the financial support from the CSIR, New Delhi. We gratefully acknowledge Professor Fayaz Ahmad (Head of the Department, Zoology, UoK.) for providing laboratory facility.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

<table>
<thead>
<tr>
<th>Year</th>
<th>Samples Examined</th>
<th>Positive</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>434</td>
<td>171</td>
<td>39.40%</td>
</tr>
<tr>
<td>2018</td>
<td>453</td>
<td>178</td>
<td>39.29%</td>
</tr>
<tr>
<td>Total</td>
<td>887</td>
<td>349</td>
<td>39.43%</td>
</tr>
</tbody>
</table>
Table 2 Species wise prevalence in scat of cat.

<table>
<thead>
<tr>
<th>Helminth of Cat</th>
<th>Year 2017 (n=434)</th>
<th>Year 2018 (n=453)</th>
<th>Total (n=887)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive Scats</td>
<td>Frequency</td>
<td>95% Confidence limits</td>
</tr>
<tr>
<td>Toxocara cati</td>
<td>114</td>
<td>26.26%</td>
<td>22.11-30.42</td>
</tr>
<tr>
<td>Spirometra spp.</td>
<td>78</td>
<td>17.97%</td>
<td>14.35-21.60</td>
</tr>
<tr>
<td>Dipylidium caninum</td>
<td>83</td>
<td>19.12%</td>
<td>15.41-22.84</td>
</tr>
<tr>
<td>Taenia spp.</td>
<td>97</td>
<td>22.81%</td>
<td>15.84-23.33</td>
</tr>
</tbody>
</table>

Table 3 Seasonal prevalence of helminths in scats of cat.

<table>
<thead>
<tr>
<th>Helminths of Cat</th>
<th>Toxocara cati</th>
<th>Spirometra spp.</th>
<th>Dipylidium caninum</th>
<th>Taenia spp.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Frequency</td>
<td>Positive</td>
<td>Frequency</td>
</tr>
<tr>
<td>Winter 2017</td>
<td>11</td>
<td>11.22%</td>
<td>8</td>
<td>8.16%</td>
</tr>
<tr>
<td>(n=98)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 (n=104)</td>
<td>15</td>
<td>14.42%</td>
<td>10</td>
<td>9.61%</td>
</tr>
<tr>
<td>Total (n=202)</td>
<td>26</td>
<td>12.87%</td>
<td>18</td>
<td>8.91%</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>25</td>
<td>24.27%</td>
<td>17</td>
<td>16.50%</td>
</tr>
<tr>
<td>(n=103)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 (n=108)</td>
<td>24</td>
<td>22.22%</td>
<td>18</td>
<td>16.66%</td>
</tr>
<tr>
<td>Total (n=211)</td>
<td>49</td>
<td>23.22%</td>
<td>35</td>
<td>16.58%</td>
</tr>
<tr>
<td>Summer 2017</td>
<td>43</td>
<td>36.13%</td>
<td>32</td>
<td>26.89%</td>
</tr>
<tr>
<td>(n=119)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 (n=122)</td>
<td>45</td>
<td>36.88%</td>
<td>33</td>
<td>27.04%</td>
</tr>
<tr>
<td>Total (n=241)</td>
<td>88</td>
<td>36.51%</td>
<td>65</td>
<td>26.97%</td>
</tr>
<tr>
<td>Autumn 2017</td>
<td>35</td>
<td>30.70%</td>
<td>21</td>
<td>18.42%</td>
</tr>
<tr>
<td>(n=114)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018 (n=119)</td>
<td>37</td>
<td>31.09%</td>
<td>22</td>
<td>18.48%</td>
</tr>
<tr>
<td>Total (n=233)</td>
<td>72</td>
<td>30.90%</td>
<td>43</td>
<td>18.45%</td>
</tr>
</tbody>
</table>

Table 4 Mixed infection of helminths in scats of cat.

<table>
<thead>
<tr>
<th>Mixed Infection</th>
<th>Total samples examined</th>
<th>Total Positive (Prevalence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td></td>
<td>62 (6.98%)</td>
</tr>
<tr>
<td>Double</td>
<td></td>
<td>173 (19.50%)</td>
</tr>
<tr>
<td>Triple</td>
<td>887</td>
<td>112 (12.62%)</td>
</tr>
<tr>
<td>Quadruple</td>
<td>2</td>
<td>2 (0.22%)</td>
</tr>
</tbody>
</table>

IUSTRI©2020
www.ijstr.org

317
REFRENCES:


[36] Barutzki D, Schaper R. (2011). Results of parasitological examination of faecal samples from cats and dogs in


