Prevalence of *Campylobacter* sp. in Dogs Attending Veterinary Practices at Mathura, India and Risk Indicators Associated with Shedding

Rajesh Kumar, A.K. Verma, Amit Kumar, Mukesh Srivastava and H.P. Lal

1Department of Veterinary Clinical Medicine, 2Department of Veterinary Epidemiology and Preventive Medicine, 3Department of Veterinary Microbiology and Immunology, 4Department of Veterinary Clinical Medicine, Uttar Pradesh Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishvidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura, U.P., 281001, India

Corresponding Author: Rajesh Kumar, Department of Veterinary Clinical Medicine, Uttar Pradesh Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishvidyalaya Evam Go-Anusandhan Sansthan (DUVASU), Mathura, U.P., 281001, India

ABSTRACT

Campylobacteriosis is one of the leading causes of gastroenteritis in humans and various researches suggested that owning a pet is a risk factor for the disease. To determine the prevalence and risk indicators for *Campylobacter* sp. infecting dogs attending veterinary practice at TVCC, DUVASU, Mathura, 100 dogs with and without the clinical symptoms of diarrhoea were examined and the prevalence of *Campylobacter* sp. was 51.0%. Breed wise prevalence showed that nondescript (73.68%) dogs were more likely to carry *Campylobacter* sp. A significant difference in isolation rates was observed between younger and older dogs: 56.58% of the younger dogs (≤ 1 year) were positive, compared with 33.35% of adult dogs (> 1 year) (p<0.01) as seen at the veterinary University, Mathura, India. Dogs sharing a household with another dog, dogs that had not received antibiotic treatment in the previous months and the age of the dog were significant indicators of Campylobacter carriage. Recent diarrhoea or vomiting in dogs with Campylobacter, breed, sex or vaccination status were not statistically significant. The high prevalence of *Campylobacter* in puppies supports the hypothesis that dogs, particularly young ones shed *Campylobacter* spp., which can be of impact for public health.

Key words: *Campylobacter*, dog, prevalence, predisposing factor

INTRODUCTION

*Campylobacter* spp. is one of the leading causes of human bacterial gastroenteritis (Adak et al., 2002; Anonymous, 2008; Acke et al., 2009) globally and also responsible for the mortality and morbidity, especially among children. Campylobacters have been reported to cause severe conditions like Guillian Barre syndrome, Chinese paralytic syndrome, hepatitis, meningitis and reactive arthritis (Allos, 1997; Korman et al., 1997; Tenkate and Stafford, 2001). The incidence of campylobacteriosis in patients i.e., those using immunosuppressive drugs, having acquired immunodeficiency syndrome (AIDS) was 39 times higher than the rate in general population (Sorvillo et al., 1991; Robinson and Pugh, 2002), which is the cause for concern, especially in developing countries like India. There is evidence of increased risk of *Campylobacter* infection in humans associated with dog or pet ownership (Kapperud et al., 1992; Adak et al., 1995;
Tenkate and Stafford, 2001). Dogs and cats and have been identified as asymptomatic carrier of *Campylobacter* spp. and shedding it in their faeces. Pathogens in their faeces may ultimately infect other animals by contaminating the environment (Morse and Duncan, 1975; Fox, 1990; Hald and Madsen, 1997). The prevalence of *Campylobacter* sp. carriage also appears high in Kennelled dogs relative to other populations (Workman et al., 2005; Acke et al., 2006; Tsai et al., 2007). Keeping in view the above facts the present study was carried out to determine the prevalence of the *Campylobacter* sp. carrier status of dogs attending veterinary practice at Teaching Veterinary clinical complex, DUVASU, Mathura and to identify possible predisposing factors.

MATERIALS AND METHODS

During the study period (between October, 09 to April 10), dogs visiting veterinary practice at Teaching Veterinary Clinical Complex (TVCC), DUVASU, Mathura for any reason including routine checks, neutering, vaccination or clinical disease, were selected as the target population. Owner consent was obtained for sampling, along with details of the animal's signalment and health status. A total of 100 rectal swabs from dogs were collected aseptically and brought to laboratory at 4°C for the isolation of *Campylobacter* sp.

**Bacterial culture:** All the samples were processed in *Campylobacter* Enrichment Hi VegTM Broth Base (HiMedia, Mumbai) with addition of polymyxin B sulphate, rifampicin, trimethoprim and cycloheximide (*Campylobacter* selective IV, HiMedia, Mumbai) and incubated at 42-43°C for 24 h. After incubation, the inoculums was streaked onto selective media (*Campylobacter* selective agar, HiMedia, Mumbai) supplemented with 10% defibrinated lysed sheep blood and reconstituted contents of *Campylobacter* selective-I (HiMedia, Mumbai) containing polymyxin B, vancomycin, trimethoprim and cephalothin and incubated for 48 h at 42-43°C under microaerophilic conditions. Characteristic Campylobacter colonies were picked up and subjected to presumptive identification like Gram's staining, motility, oxidase and catalase test and further subjected to biochemical test for confirmation (Skirrow and Benzamin, 1980; Gracia et al., 1985).

**Statistical analysis:** The prevalences of *Campylobacter* species recovered from the samples in each group (cohabitation with another dog; recent (within the past month) antibiotic treatment; recent clinical signs such as diarrhoea or vomiting; sex; breed and age) were compared using chi-squared analysis as per Snecocor and Cochran (1980).

RESULTS

*Campylobacter* sp. were isolated from 51 of the 100 dogs, giving a carrier status prevalence of 51.00% (Table 1). Dogs in cohabitation with other dog, which were positive for *Campylobacter* sp. were significantly associated with carrier status (p<0.05). Although there was a trend for dogs that had not received antibiotic treatment in the previous month to be positive for *Campylobacter* sp but this was not statistically significant. Clinical signs such as diarrhea and/or vomiting could be observed in dogs. Of the dogs sampled, 43 had such clinical signs. No significant association was found between clinical signs and *Campylobacter* isolation in the faecal sample. Similarly, there were no significant associations between *Campylobacter* sp. carrier status and sex. However, in breed wise prevalence analysis we could not include all the breeds because in some breeds numbers of animals were very low. Breed wise prevalence analysis revealed that presence of *Campylobacter* varied significantly (p<0.05) among different breeds (Table 1). It was the higher
Table 1: Prevalence of *Campylobacter* spp. in dogs influenced by cohabitation with other dog, recent antibiotic treatment, clinical signs, sex, breed and age

<table>
<thead>
<tr>
<th>Risk factors status</th>
<th>No. tested</th>
<th>Positive</th>
<th>Percentage positivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohabitation with other dog</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18</td>
<td>14</td>
<td>77.78</td>
</tr>
<tr>
<td>No</td>
<td>82</td>
<td>39</td>
<td>47.56</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>51</td>
<td>51.00</td>
</tr>
<tr>
<td><strong>Recent antibiotic treatment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
<td>18</td>
<td>72.00</td>
</tr>
<tr>
<td>No</td>
<td>75</td>
<td>33</td>
<td>44.00</td>
</tr>
<tr>
<td><strong>Recent diarrhoea or vomiting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>57</td>
<td>31</td>
<td>54.38</td>
</tr>
<tr>
<td>No</td>
<td>43</td>
<td>20</td>
<td>46.51</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>62</td>
<td>31</td>
<td>50.00</td>
</tr>
<tr>
<td>Female</td>
<td>38</td>
<td>20</td>
<td>52.63</td>
</tr>
<tr>
<td><strong>Breed</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nondescript</td>
<td>19</td>
<td>14</td>
<td>73.68</td>
</tr>
<tr>
<td>Other breed</td>
<td>81</td>
<td>37</td>
<td>45.68</td>
</tr>
<tr>
<td><strong>Age</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= 1 year</td>
<td>76</td>
<td>43</td>
<td>56.58</td>
</tr>
<tr>
<td>&gt; 1 year</td>
<td>24</td>
<td>8</td>
<td>33.33</td>
</tr>
</tbody>
</table>

*Significant at (p<0.05), **Significant at (p<0.01)

in nondescript (73.68%) dogs as compared to the breed (45.68%). *Campylobacter* spp. were isolated from 43 of the 76 dogs that were aged one year old or younger (56.58%) and from 8 of the 24 older dogs aged >1 year (33.33%) (p<0.01) (Table 1).

**DISCUSSION**

*Campylobacters* are now getting increasing recognition as important human and animal pathogens. The results showed that *Campylobacter* sp. were common in dogs. The 51.00% prevalence of *Campylobacter* sp. in canine faecal samples reported in this study was in the upper side of the range (17-50%) of prevalence data previously reported (Sandberg et al., 2002; Engvall et al., 2003; Hald et al., 2004; Koene et al., 2004; Wieland et al., 2005; Rossi et al., 2008; Acke et al., 2009; Parsons et al., 2010). Differences between these studies may reflect differences in the populations investigated, or in the detection methods used for *Campylobacter* infection (Hald and Madsen, 1997; Byrne et al., 2001; Kulkarni et al., 2002; Lebarca et al., 2002; Sandberg et al., 2002; Lastovic and Roux, 2003; Hald et al., 2004; Wieland et al., 2005; Acke et al., 2006; Guest et al., 2007; Rossi et al., 2008; Acke et al., 2009; Parsons et al., 2010). Dogs' cohabitant with other dogs was more likely to carry *Campylobacter* sp. as previously reported (Torre and Tello, 1993; Workman et al., 2005; Parsons et al., 2010). Torre and Tello (1993) pointed out that overcrowding increases the probability of acquiring infection and found a higher prevalence of the agent among animals that lived with other animals. This prevalence was more important and statistically significant, if they lived with positive ones. Acke et al. (2006) suggested that dogs housed in groups, such as kennels, had a higher prevalence of *Campylobacter* carriers, possibly due to crossinfection. Damborg et al. (2008) found indistinguishable amplified fragment length polymorphism patterns in *Campylobacter* strains isolated from dogs sharing a house or kennel. The prevalence in dogs living in groups (for example pounds and kennels) was higher than
in single household pets, probably as a result of the stress, frequent dietary changes and increased incidence of gastrointestinal disease suffered by animals in pounds or kennels (Acke et al., 2009). Although there was a trend for dogs that had not received antibiotic treatment in the previous month to be positive for Campylobacter sp. but this was not statistically significant. Of the 57 dogs having diarrhoea or vomition, Campylobacter sp. could be isolated for 37 dogs, showing higher prevalence of Campylobacter infection in diarrheic dogs (Table 1). However, statistically significant relationship between the carrier state and the development of clinical campylobacteriosis in dogs could not be found. Similar to our findings some earlier studies also found no significant relationship between diarrhoea and Campylobacter spp. infection status (Sandberg et al., 2002; Engvall et al., 2003; Workman et al., 2005; Acke et al., 2006; Rossi et al., 2008; Parsons et al., 2010), suggesting that the organism is a commensal (Engvall et al., 2003), while others report an association between infection and clinical signs (Guest et al., 2007), particularly in younger dogs (Fox et al., 1983; Nair et al., 1985; Burnens et al., 1992). As majority of these animals had concurrent gastrointestinal disease, Campylobacter infection was probably secondary to this underlying disease. Campylobacter sp. can be found in dogs with gastrointestinal signs as an opportunistic infection (for example, secondary to exocrine pancreatic insufficiency, endoparasites, or coronavirus and parvovirus infections) and they may act as a primary or secondary pathogen (Olson and Sandsted, 1987). The link between the gastrointestinal signs and the presence of Campylobacter organisms has been investigated but is still unclear. In addition, there have been large differences between the designs of the studies and standardised studies are needed to determine whether Campylobacter sp. can cause significant disease as a primary pathogen (Olson and Sandsted, 1987; Sandberg et al., 2002; Acke et al., 2006, 2009). Campylobacter-confirmed cultures were detected in 46.51% of the healthy dogs showing that asymptomatic animals can be carriers of Campylobacter sp. These animals may be an important reservoir for Campylobacter sp. and a source of infection for other pets and human beings (Olson and Sandsted, 1987; Acke et al., 2006, 2009). There was no statistically significant association between Campylobacter carrier status and sex (Nair et al., 1985; Parsons et al., 2010). There was significant difference of the Campylobacter sp. prevalence in nondescript dogs (73.68%) as compared to breed dogs (45.68%). The probable reason may be the way of rearing of dogs, as non descriptive ones are allowed to move outside the home more freely in comparison to breed dogs and thus may get infection from stray dogs and other animals leaving in and around the residential areas.

When age was investigated as a risk indicator for Campylobacter sp. carriage in dogs, similar to previous studies (Torre and Tello, 1993; Sandberg et al., 2002; Engvall et al., 2003; Wieland et al., 2005; Acke et al., 2006; Guest et al., 2007; Acke et al., 2009) we also found that younger rather than older dogs were more likely to carry Campylobacter sp. suggesting an age predisposition and the consequence of age-related immunity. However, a small number of reports (Wieland et al., 2005; Tsai et al., 2007) have suggested that age is not a predisposing factor for Campylobacter infection.

This study has the limitations of a cross-sectional design; nevertheless, it is performed in only one veterinary practice considering a small number of population and few related variables. A detailed study should be conducted considering larger sample size or whole population in order to accomplish a better understanding of the epidemiology of this disease in developing countries and in that way facilitate the decisions about actions to diminish the risk of this infection in human beings.
CONCLUSIONS

The high prevalence of Campylobacter carriers found in dogs in this study suggests the bacteria may be intestinal commensal in this species. Although the relationship between the presence of Campylobacter sp. and gastroenteritis in both dogs and humans is still not very clear, the prevalence of Campylobacter sp. infection in our studied population was high; such animals attending veterinary practice are likely to be a source of Campylobacter sp. infection for humans. We observed that dogs aged one year old had higher prevalence of Campylobacter infection than adult dogs; it is worth highlighting that puppies in particular may pose a zoonotic risk. To establish the zoonotic potential of canine Campylobacter isolates, both human and canine isolates have to be further characterized and compared.

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