Prevalence and Antibiogram of Campylobacter Infections in Dogs of Mathura, India

Rajesh Kumar, A.K. Verma, Amit Kumar, Mukesh Srivastava and H.P. Lal
Department of Veterinary Clinical Medicine, College of Veterinary and Animal Husbandry, Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishvidhyalaya Evum Go-Anusandhan Sansthan (DUVASU), Mathura, Uttar Pradesh, 281001, India

Corresponding Author: Rajesh Kumar, Department of Veterinary Clinical Medicine, College of Veterinary and Animal Husbandry, Pandit Deen Dayal Upadhyay Pashu Chikitsa Vigyan Vishvidhyalaya Evum Go-Anusandhan Sansthan (DUVASU), Mathura, Uttar Pradesh, 281001, India

ABSTRACT

With the increasing trends of pet ownership the chances of campylobacteriosis are also increasing as these pets are kept in close vicinity of owners. The prevalence and antimicrobial sensitivity profiles of Campylobacter isolates from faeces of dogs attended in veterinary practice at Teaching Veterinary Clinical Complex, Mathura, India. During the period of investigation (October 2009 to April 2010), 100 rectal swabs from dogs were collected and transported to the laboratory for further investigations. Bacteriological examination revealed 51.00% prevalence rate of Campylobacter isolates in dogs faecal samples. The disc-diffusion method was used to know the susceptibility of all the 51 Campylobacter isolates against 10 commonly used antimicrobials in pet animal practice. High rates of resistance were observed to erythromycin (90.20%), tetracycline (88.23%), ampi-cloxacillin (88.23%), ciprofloxacin (80.39%), enrofloxacin (68.63%) and amoxicillin-clavulanic acid (19.61%). All the Campylobacter isolates were susceptible to amikacin, levofloxacin and streptomycin. Erythromycin and ciprofloxacin are drugs for treatment of human campylobacteriosis. The high resistance rate to these drugs among Campylobacter isolates from dog faeces is of public health significance as dogs are supposed to be the main source of infection in human beings.

Key words: Prevalence, Campylobacter, dogs, drug resistance

INTRODUCTION

Enteropathogenic bacteria have long been recognized as a significant problem owing to their pathogenicity potential to animals and their zoonotic risk to humans. Among them, Campylobacters have been considered to be important pathogens causing human gastroenteritis, arthritis, meningitis globally (Goldberg and Rubin, 1988; Peterson, 1994; Baserisalehi et al., 2006; Humphrey et al., 2007; Frederick and Huda, 2011) and leading to serious impact on public health (Ethelberg et al., 2004). Dogs are contaminated by oral-fecal contact and by manifesting gastroenteritis or acting as healthy carriers, serve as a potential source of infection to humans (Bruce and Fleming, 1983; Goossen et al., 1991; Burnens et al., 1992; Ene et al., 1992; Moreno et al., 1993; Torre and Tello, 1993; Fernandez et al., 1994; Robinson and Pugh, 2002; Workman et al., 2005; Sabry, 2009). Dogs in developing countries like India often live
in close proximity to humans (with the possibility of direct transmission of pathogens) and have not been examined thoroughly for Campylobacter sp. carriage. There is a dearth of information and research on the prevalence and antimicrobial resistance studies of Campylobacters in dogs in India in spite of the reports in Europe and other parts of the world on dogs as a potential sources of infections for humans.

This study therefore, ascertained the prevalence and drug resistance profiles of Campylobacter spp. isolated from dogs in Mathura, India in order to provide updated information and the suspected role of dogs in its zoonotic significance.

MATERIALS AND METHODS

Rectal swabs were collected aseptically from 100 dogs presented to veterinary practice at Teaching Veterinary Clinical complex (University Veterinary Hospital), DUVASU, located in Mathura, India and transported at 4°C to the laboratory on the day of collection for the isolation of Campylobacter spp.

Isolation and identification of Campylobacter spp.: All the samples were processed in Campylobacter Enrichment Hi Veg TM Broth Base (HiMedia, Mumbai) with addition of polymixin B sulphate, rifampicin, trimethoprim and cycloheximide (Campylobacter selective IV, HiMedia, Mumbai) and incubated at 42-45°C under micro aerobic conditions for 24 h. After incubation, the inoculum 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 polymixin B, vancomycin, trimethoprim and cephalothin and incubated for 48 h at 42-43°C under micro aerobic 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).

Antimicrobial sensitivity assay: All the Campylobacter isolates were assessed for their antimicrobial susceptibility testing by the disc-diffusion method following the NCCLS guidelines (NCCLS, 2002). The following antimicrobial agents were used at the indicated concentrations (µg disc⁻¹ except where specified): using 10 commonly used antibiotic discs (Hi-Media, Mumbai) viz., amikacin (30 g), amoxycillin-clavulanic acid (20/10 µg), ampicloxacillin (10 µg), ciprofloxacin (30 µg), chloramphenicol (30 µg), enrofloxacin (10 µg), erythromycin (15 µg), levofloxacin (5 µg), streptomycin (10 µg) and tetracyclin (30 µg).

RESULTS

Campylobacter spp. was isolated from 51 dogs of the total 100 dogs (percent positivity 51.00%). The results of antibiotic sensitivity test for the ten antimicrobial agents for Campylobacter spp. is shown in Table 1. Using the disc diffusion method, 46 out of 51 isolates of Campylobacter (90.20%) were resistant to erythromycin, 45 to tetracycline (88.23%), 45 to ampi-cloxacillin (88.23%), 41 to ciprofloxacin (80.39%), 35 to enrofloxacin (68.63%) and 10 to amoxycillin-clavulanic acid (19.61%). All the Campylobacter isolates were susceptible to amikacin, chloramphenicol, levofloxacin and streptomycin.
Table 1: Antibiotic sensitivity test of Campylobacter spp. isolates of dogs

<table>
<thead>
<tr>
<th>Antimicrobial agents</th>
<th>No. of isolates (51)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resistant</td>
</tr>
<tr>
<td>Amikacin</td>
<td>0</td>
</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td>10</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>45</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>41</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>0</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>35</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>46</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>0</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>0</td>
</tr>
<tr>
<td>Tetracycln</td>
<td>45</td>
</tr>
</tbody>
</table>

S: Sensitivity, I: Intermediate, R: Resistant

**DISCUSSION**

Elucidating the shedding patterns and prevalence of Campylobacters in the faeces of dogs is a prerequisite for effective healthcare strategy against zoonotic infections. The species distribution of Campylobacter isolates from dogs and other animals differs considerably between publications and years (Hald and Madsen, 1997; Lopez et al., 2002; Sandberg et al., 2002; Hald et al., 2004; Workman et al., 2005; Mohammad and Mohagheghi, 2006; Baserisalehi et al., 2007b; Huat et al., 2010). The introduction of antimicrobial agents in human and animal therapy has had a great impact on population. The first agents were introduced during the 1930s and resistance to these drugs gradually emerged with their worldwide use. Campylobacter spp. is classified as an emerging human pathogen and recently, concern regarding the prevalence of campylobacteriosis has increased because of the frequent isolation of antimicrobial-resistant strains from humans and animals. After exposure to ten antibiotics, several isolates showed multiple resistances to most of the antibiotics used. Studies related to the sensitivity to antibiotics of Campylobacter spp. in different countries show different degrees of resistance to the same drug (Guevremont et al., 2006; Han et al., 2007; Little et al., 2008; Moran et al., 2009). In this study, majority of Campylobacter spp. isolates showed resistance to at least 5 of the antibiotics tested, indicating multi-drug resistance. In the present work, all isolates were sensitive to amikacin, chloramphenicol, levofloxacin and streptomycin. Sensitivity to chloramphenicol by all Campylobacter isolates was also observed in pigs (Saenz et al., 2000; Guevremont et al., 2006), whereas, similar resistance patterns for Campylobacter spp. was obtained from humans (Bardon et al., 2009) and chickens (Miflin et al., 2007).

Majority of the isolates were resistant to erythromycin, tetracycline, ampi-cloxicin, ciprofloxacin and enrofloxacin. Resistance to tetracycline by Campylobacter isolates from humans, dogs and other animals may range from 15 to 94% (Modolo et al., 1991; Gaudreau and Gilbert, 1998; Saenz et al., 2000; De Vega et al., 2005). The great variability in this antibiotic's efficacy is probably due to its worldwide use in cattle, both at therapeutic or low doses; this would increase selective pressure on bacteria. Clinical assays, however, have shown the therapeutic efficacy of tetracycline in treating dogs with Campylobacteriosis and a decrease in re-excretion rate (Abrahams et al., 1990; Burnens et al., 1992). High resistance to ampi-cloxicin for Campylobacter spp. i.e., 57.3% (Little et al., 2008) and 65.7% (Saenz et al., 2000) was also recorded in samples from
pigs and 43.1% (Han et al., 2007) and 40.8% (Miflin et al., 2007) in samples from chicken. Similar results were obtained in this study, where 88.23% of the strains showed resistance to ampicillin.

*Campylobacter* was frequently sensitive to quinolones; however, an increased resistance to these drugs is seen, probably due to genetic mutations interfering with bacterial DNA gyrase (Greene and Watson, 2003). Selective pressure caused by the indiscriminate use of these drugs in aviculture is a contributory factor. Previous studies (Saenz et al., 2000; Norma et al., 2007; Biasi et al., 2011) reported the greatest resistance of *Campylobacter* isolates to quinolones among various antibiotics similar to results obtained in the current study, in which 80.39% of the isolates were resistant to ciprofloxacin. Contrary to our findings, sensitivity to ciprofloxacin for all the 152 strains of *Campylobacter* spp. isolated from chicken in Australia (Miflin et al., 2007); 70 isolates from domestic animals and poultry from India (Baserisalehi et al., 2007a); isolates from environmental samples (Baserisalehi and Bahador, 2008) was also reported earlier, whereas ciprofloxacin resistance in only 0.3% of isolates was confirmed from cattle in Canada (Inglis et al., 2005). The resistance patterns displayed by *Campylobacter* isolates from dogs to fluoroquinolone (ciprofloxacin) and macrolides (erythromycin) classified as second line and first line antimicrobials are of particular importance, since patients suffering from Campylobacteriosis are usually treated with these antimicrobials agents (Uaboi-Egbenni et al., 2011).

Recent scientific studies has shown that *Campylobacter* antimicrobial resistance can be related to some specific genes and the dissemination of these genes of microorganisms to their progeny and across to other unrelated bacteria species through extrachromosomal DNA fragment called the plasmid from one animal species to another and to humans is possible (Baserisalehi and Bahador, 2008; Apata, 2009). Antimicrobial resistance observed in the present work might be due to the indiscriminate and irrational use of antimicrobials (Tambekar et al., 2007) in animals for preventive or therapeutic purposes irrespective of etiological agents. Given the relevance of the genus *Campylobacter* in human gastroenteritis, its occurrence in companion animals such as dog and the fact that majority of *Campylobacters* showed multi-drug resistance, a continuous surveillance and monitoring of the prevalence and the antimicrobial resistance of *Campylobacter* spp. in dogs and other pet animals is essential to the implementation of effective policies for controlling and preventing contamination and infection by this pathogen. The use of antibiotics as therapeutic and prophylaxis for animals should be carefully evaluated and monitored because acquisition of antibiotic resistant strains of *Campylobacters* by man has serious health implications.

CONCLUSION

In view of the heterogeneity in the results reported in the literature in comparison to data in this study, we recommend that *Campylobacter* antimicrobial susceptibility tests be performed for therapeutic purposes with the strict hygienic measures to prevent transmission from pets to owner. Our results indicate amikacin, chloramphenicol, streptomycin and levofloxacin as drugs suitable for the treatment of canine Campylobacteriosis. This also opens up therapeutic possibilities for these drugs in human Campylobacteriosis.

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REFERENCES


