

## Antimicrobial Resistance Pattern of Fecal *Escherichia coli* Isolated from Non-Diarrhoeic Pet Dogs at Chittagong Metropolitan Area

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### Original Research Article

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#### Article History

Received: 01.05.2018

Accepted: 15.05.2018

Published: 30.06.2018

#### DOI:

10.36347/sjavs.2018.v05i06.003



**Abstract:** The study was designed with the aim of isolation and identification of *Escherichia coli* and estimation of its antimicrobial resistance to ascertain the prevalence in pet dogs. A total of 36 *Escherichia coli* isolates recovered from 82 rectal swab samples of non diarrhoeic pet dogs at Chittagong Metropolitan area. Antimicrobial resistance was determined with 9 antimicrobial agents by means of disc diffusion assay. 100% resistance was observed in Ampicillin which was followed by Amoxicillin (95.83%), Colistin Sulfate (79.16%), Oxytetracycline (75%), Cotrimoxazole (75%), Ciprofloxacin (70.83%) and Ceftriaxone (62.5%). Conversely, 58.33% sensitivity was shown by Gentamicin and 91.66% intermediately sensitive as Doxycycline. All *Escherichia coli* isolates were reported as resistant to more than five antibiotics (multidrug-resistant). Therefore, more attention should be paid to the indiscriminate use of antimicrobials in companion animals (dogs) and they should be treated with sensitized drugs on the basis of result of the sensitivity study in the specific areas.

**Keywords:** Antimicrobial resistance, *Escherichia coli*, rectal swab, non-diarrhoeic pet dogs.

### INTRODUCTION

Increased prevalence of antimicrobials resistance of pathogenic bacteria is a growing concern worldwide. It's due to the emergence and dissemination of resistant bacteria and resistance genes [12]. Dogs are probably pets to which most antimicrobial agents are administered. The antimicrobial substances used in dogs are often similar to those used in human medicine [15].

Heavy use of antibiotics to animals to enhance growth may increase the level of resistant bacteria [9]. Hospitalized animals are frequently exposed to an environment laden with antimicrobial substances which may facilitate the transmission of resistance genes [15]. Pets are in close contact with people and there is ample opportunity for exchange of resistance genes between bacteria from these different host species. This resistance can be disseminated by the spread of bacteria or by transfer of genes to other bacteria [2]. It is well recognized today that resistance genes can be exchanged among bacteria populations [6]. *Escherichia coli* (*E. coli*) is an inhabitant of normal flora of the gastrointestinal tract of humans and animals, and is believed to facilitate food digestion through enzyme synthesis. Few of them are potentially pathogenic and known to be a very good indicator for selection pressure by antimicrobial use and for resistance problems to be expected in pathogens [8]. Several studies were carried out on antimicrobial resistance in fecal *Escherichia coli*

isolates from stray dogs [1, 10, 11, 14]. To our knowledge, however, there has been no previous study on antimicrobial resistance in fecal indicator bacteria from healthy or sick dogs in Bangladesh. Here, the study was designed with the aim of isolation and identification of *Escherichia coli* and estimation of its antimicrobial resistance to ascertain the prevalence in pet dogs at Chittagong Metropolitan area.

### MATERIALS AND METHODS

#### Ethical approval

The study was approved by the ethical committee of the Faculty of Veterinary Medicine, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh.

#### Study population and duration

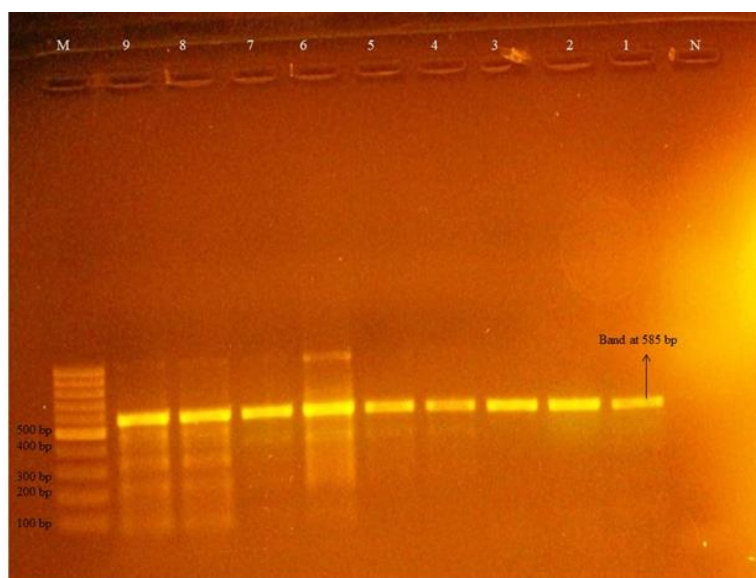
A total of 82 samples were collected from pet dogs of Chittagong Metropolitan area during the period of September, 2016 to February, 2017.

### Laboratory diagnosis

MacConkey and Eosin Methylene Blue agar were used to isolate *E. coli* from the samples following standard procedures. All the *E. coli* isolates (36) were subjected to indole test. Isolates positive to indole test (36) were further confirmed by the presence of gene *Eco* through PCR following procedures described by Wang [16]. Finally, the isolates were tested for

susceptibility to the antibiotics: Gentamicin, Doxycycline, Ciprofloxacin, Oxytetracycline, Amoxicillin, Ampicillin, Colistin sulfate, Sulfamethoxazole & Trimethoprim and Ceftriaxone as recommended by the Clinical and Laboratory Standard Institute [4] using disc diffusion method [5].

### RESULTS AND DISCUSSION



**Fig-1**

In 82 rectal swab samples from pet dogs, 36 (44%) samples were found positive for the *Eco* gene. Amplicons of some of the *Eco* gene positive *E. coli* is shown in (Figure 1).

Figure 1: Results of PCR for 16s rRNA gene of *E. coli*; Lane M: 100 bp ladder; Lane N: Negative control; Lane 1-9: 16S rRNA gene-sized (585bp) amplicon.

An important highlight of the present study was that it provided an illustration on the prevalence of multidrug resistant *E. coli* in pet dog in Chittagong Metropolitan area, Bangladesh. About 44% pet dog samples reared in the Chittagong might contain multidrug resistant *E. coli*, posing a serious threat to the public health. From the (Figure 2), we saw that the

resistancy pattern of *E. coli* isolates were - 100% resistant to Ampicillin (AMP), 95.83% resistant & 4.16% intermediately sensitive to Amoxicillin (AMX), 75% resistance & 25% intermediately sensitive to Oxytetracyclin (OT), 29.16% resistant, 12.5% intermediately sensitive & 58.33% sensitive to Gentamycin, 62.5% resistant, 29.16% intermediately sensitive & 8.33% sensitive to Ceftriaxone, 75% resistant, 20.83% intermediately sensitive & 4.16% sensitive to Sulfamethoxazole & Trimethoprim (SXT), 8.33% resistant & 91.66% intermediately sensitive to Doxycyclin, 79.16% resistant & 20.83% intermediately sensitive to Colistin Sulfate (CT), 70.83% resistant, 20.83% intermediately sensitive & 8.33% sensitive to Ciprofloxacin. This finding was consistent with the results of some other studies of Kinge,

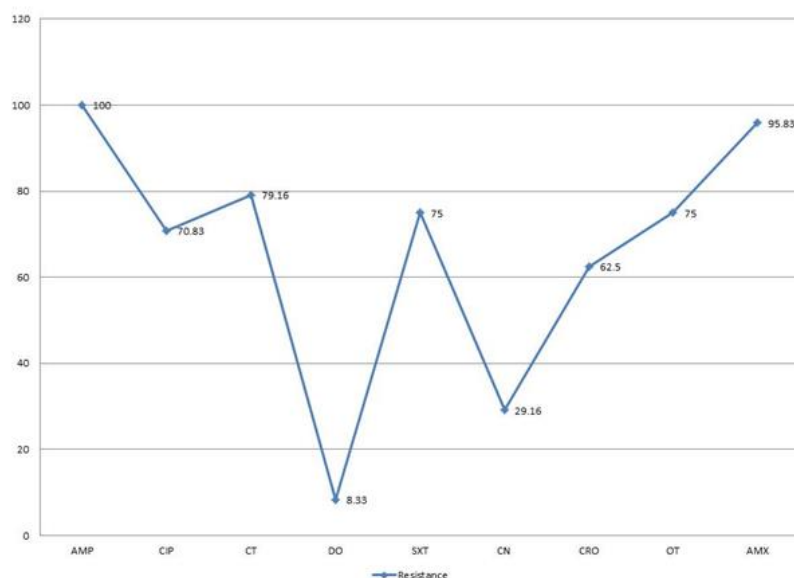


Fig-2

Rantala, Nam and Adesiyun [1, 7, 10,14] reporting its almost similar prevalence in pet dogs. Figure 2: Resistance pattern of *E. coli* positive isolates against different antimicrobials. For the nine antimicrobial agents tested, *E. coli* isolates from dogs displayed the highest prevalence of resistance to 5 antimicrobial agents (AMP, AMX, SXT, OT & CT) which was above 74% compared with all the other antimicrobials which was partially similar to the results found by Nadira and Adesiyun [11]. Furthermore, significantly elevated resistance levels were reported towards some higher antibiotic classes, especially towards the cephalosporin 3rd generation eg. Ceftriaxone. This fact may be as result of Extended-Spectrum  $\beta$ -lactamases (ESBLs) production by *E. coli* strains which is regarded as one of the most important resistance factors in gram negative bacteria by Asbel [3]. It was noted that all isolates exhibited resistance to more than five antibiotics, which defined them as multidrug resistant strains as reported earlier by Zhao & Rahman [13,17].

## CONCLUSION

In conclusion, our results support the fact that the use of antimicrobials and the development of and prevailing antimicrobial resistance among bacteria are linked together. Here we found that resistance in *E. coli* to commonly used antimicrobials is widespread, the efficacy of sulphatrimethoprim, higher generation of cephalosporin (ceftriaxone) & fluoroquinolones (ciprofloxacin), oxytetracyclin, colistin sulfate is at risk to deteriorate. Although resistance to other antimicrobials e.g. gentamycin, doxycycline was found to be below, but the efficacy of amoxicillin and ampicillin is at vulnerable condition. The high prevalence of multidrug resistance is also a phenomenon, which gives

cause for concern because it may pose zoonotic and therapeutic problems.

## ACKNOWLEDGMENT

Authors sincerely desire to express deepest sense of gratitude to faculty member at Department of Microbiology and Veterinary Public Health, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh for their guidance at the time of chemotherapeutic method of treatment.

## CONFLICT OF INTERESTS

All authors declared that they have no conflict of interests

## AUTHORS' CONTRIBUTION

Nasima Akter carried out the experiment and prepared the manuscript. Md. Saiful Islam and Arup Ratan Sen helped to prepare the manuscript. Sonnet Poddar helped in formatting the manuscript

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