

Original Research Article

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Multidrug Resistant *E. coli* Isolated from Kadaknath Poultry Bird

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ABSTRACT

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E. coli isolates from Kadaknath poultry birds were tested for *in vitro* sensitivity towards total 09 antibacterial drugs viz. Azithromycin, Cefuroxime, Cephalothin, Cefepime, Erythromycin, Enrofloxacin, Kanamycin, Norfloxacin and Moxifloxacin. Most of the *E. coli* isolates was only found sensitive to three antibiotics viz. Azithromycin, Cefuroxime and Cefepime, while all other drugs were showing high resistance. Multi drug resistance to antibacterial agents was observed in maximum *E. coli* isolates.

Introduction

Kadaknath is an Indian breed of chicken local to Jhabua and Dhar districts. Extraintestinal infection with avian pathogenic *Escherichia coli* (APEC) induces colibacillosis in chickens. It is characterized by polyserositis, septicemic shock, and cellulitis and is responsible for enormous economic losses and frequent antibiotic treatment (Kim *et al.*, 2007).

Antimicrobial therapy is an important tool in reducing both the incidence and mortality associated with avian colibacillosis. However, in poultry flocks, inappropriate antibiotic therapy and using antibiotics as growth promoters may result in high antibiotic

selection pressure. Therefore, poultry pathogenic bacteria contain a relatively high proportion of resistant isolates.

These resistant bacteria cause problems in rearing poultry flocks and in human health. The antimicrobial use in the chicken is expected to rise by 129%, by 2030 in the Asia-Pacific region (Touy *et al.*, 2011).

The development of resistance is a complex process associated with the presence of resistance encoding genes that are found inside plasmids or chromosomal genetic material. Integrons are the genetic material responsible for capturing resistance genes that spread via the genetic mobile elements; transposons and plasmid (Geidam *et al.*, 2012).

Materials and Methods

The liver and heart samples were collected from chickens, suspected for colibacillosis on post mortem. The presumptive isolation of bacterial isolates as *E. coli* was accomplished by colonial and bacterial morphology. Further, identification of bacterial isolates was done by both traditional methods and readymade kits (Hi media).

Traditional biochemical tests were carried out as per procedure described by Barrow and Feltham (1993), Cheesbrough (1994) and Collee *et al.*, (1996). Readymade Hi *E. coli* identification kits (Hi Media) were used for identification of isolates. All the *E. coli* isolates (n=10), were submitted to the disc diffusion test according to the as per the procedure described by Bauer *et al.*, (1966). The interpretation of result was made in

accordance with the instruction supplied by manufacture. Resistant to multiple antimicrobials was considered as MDR.

Results and Discussion

Antibiotic resistance has emerged as a major threat to public health in this century, as evident from global surveillance data. The indiscriminate and overuse of antibiotics are resulting in widespread antimicrobial resistance, which has received considerable National and International attention.

All the 10 isolates of *E. coli* were tested for *in vitro* sensitivity towards 9 antibacterial drugs. These 9 antibiotics belonged to the four groups viz. fluoroquinolones, aminoglycosides, cephalosporins and macrolids. Sensitivity of isolates to various drugs is summarized in Table 1.

Table.1 Percentage sensitivity of *E. coli* isolates to different antimicrobial agents

S. No.	Antibiotics	Total no. of isolates (n=10)					
		Sensitive		Intermediate		Resistant	
		No.	%	No.	%	No.	%
1.	Azithromycin	6	60	1	10	3	30
2.	Cefuroxime	0	00	9	90	1	10
3.	Cephalothin	0	00	0	00	10	100
4.	Cefepime	0	00	9	90	1	10
5.	Erythromycin	0	00	0	00	10	100
6.	Enrofloxacin	0	00	0	00	10	100
7.	Kanamycin	0	00	4	40	6	60
8.	Moxifloxacin	0	00	0	00	10	100
9.	Norfloxacin	0	00	0	00	10	100

E. coli isolates showed variable percentages of sensitivity and resistance to the different antibiotics. The 100 percent resistance was found against 5 antibiotics Cephalothin, Erythromycin, Enrofloxacin, Moxifloxacin and Norfloxacin. The only drug showed sensitivity was Azithromycin (Table 1).

Various antibiotics used for AST in this study have also been reported by others viz. Miranda *et al.*, (2008), Saberfar *et al.*, (2008), Abera and Kibret (2014) and Sarba *et al.*, (2019). However, variation in resistance and sensitivity percent has been found in various reports. Abera and Kibret (2014) reported 55% Azithromycin resistance level in *E. coli* which is higher than the findings of present study.

In our study, 100% *E. coli* isolates were resistant to Enrofloxacin as comparable to the findings of Kim *et al.*, (2007) and Saberfar *et al.*, (2008) who reported 71.3% and 76%, resistance, respectively. Saberfar *et al.*, (2008)

also observed resistance levels as - 0% for Kanamycin and $\geq 99\%$ for Erythromycin and the findings of Kanamycin are contrast to the present findings.

Kibret and Abera (2011) reported high resistance rate to Erythromycin (89.4%) and high sensitivity rates to Norfloxacin (90.6%). The resistivity patterns of *E. coli* strains are comparable but the findings of Norfloxacin do not collaborate with the present findings.

Multi drug resistance

It was noted that no antibiotic was 100% effective, with all the isolates (100%) presenting multidrug – resistance. Multiple drug resistance to 4 to 7 antibacterial agents simultaneously was observed in all isolates (Table 2). The maximum (40%) isolates were resistant to 4 or 7 drugs. None of the isolate was resistant to all the 9 antimicrobial agents.

Table.2 Multiple drug resistance in *E. coli* isolates.

S. No.	No. of antibiotics	No. of resistant isolates	Percent of resistant isolates (n=10)
1.	7	4	40%
2.	6	1	10%
3.	5	1	10%
4.	4	4	40%

All isolated *E. coli* showed resistance to 4 or more antibiotics, so multiple resistances was observed in all of our isolates. Multi drug resistance against was also reported by Manishimwe *et al.*, (2017), Amer *et al.*, (2018) and Subedi *et al.*, (2018). The multidrug resistance’s feature has been observed in *E. coli* samples from avian origin

in Brazil and other American countries (Zanatta *et al.*, 2004; Smith *et al.*, 2007), as well as in Europe (Guerra *et al.*, 2003), Asia (Sahoo *et al.*, 2012), Africa (Ogunleye *et al.*, 2008), etc. This fact demonstrates that the use of antimicrobials in poultry industry over the years has increasingly been favouring the emergence of resistant isolates.

The global emergence of multidrug-resistant Gram-negative bacteria is a growing threat to antibiotic therapy. This can result from different reasons, including blind antimicrobial therapy, excessive usage of antimicrobials for prophylaxis, inappropriate treatment, and impaired quarantine systems. Antibiotic-resistant bacteria pose a severe challenge to both veterinary and health professionals because they have a negative impact on therapy. Hence, it is recommended that there should be judicious use of antibiotics.

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