Susceptibility Pattern of *Escherichia coli* Isolated from Environmental Samples in Ondo State, Nigeria

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Abstract- *Escherichia coli* is a notorious and important bacterium in nosocomial infections with significant morbidity and mortality in healthcare institutions due to multi-drug resistance challenges. In this study, susceptibility pattern of environmental isolates of *E. coli* was evaluated. Environmental samples from faecal and pond water sources collected from Akure, Ondo State were subjected to bacterial isolation. *Escherichia coli* was isolated and identified presumptively using eosin methylene blue agar. The susceptibility was evaluated using agar diffusion method according to CLSI guidelines. Fifty none duplicate isolates of *E. coli* with metallic sheen were obtained of which all were resistant to amoxicillin/clavulanate (AUG) and 6 %, 46 %, 4 %, 2 %, 20 %, 16 % to cefixime, ciprofloxacin, cefuroxime, gentamicin, nitrofurantion and ofloxacin respectively. Multidrug resistance was observed in among the species with 22 % against eight antibiotics. The result of this study showed high rates of multidrug resistance of *E. coli* strains in environmental samples. Hence regular antimicrobial surveillance is essential to minimize the proliferation of resistant *E. coli* in our environment.

Keywords- Susceptibility, *E. coli*, Antibiotics, Resistance, Environmental samples

I. INTRODUCTION

*Escherichia coli* is a typical reservoir of the human and animal gut, however can likewise be found in habitats such as vegetation, soil and water. It is the main microbe causing urinary infections [1-3] and is among the most widely recognized microorganisms causing systemic [4], ear and wounds infections, as well as humans-associated complications [5, 6]. Additionally, *E. coli* is the most well-known cause of food and water-borne human disease that characterized by water stool worldwide and in evolving nations, causing numerous mortality in youngsters below five years [7].

Drug resistance in *E. coli* is a worldwide phenomenon that has serious implication in public health especially in countries with limited resources [8, 9]. An upsurge in bacterial drug resistance results in treatment failures. Conversely, more than 90 % of cases with obvious clinical manifestations are treated presumptively [10]. *Escherichia coli* resistance phenotype and distribution vary with geographical location including differences in population and habitats [11]. In Nigeria, various examinations have been done on the occurrence and antibiogram pattern of *E. coli* from different clinical samples [12-13]. Here we, examined resistance phenotypic pattern of *E. coli* obtained from environmental samples.

II. MATERIALS AND METHODS

Sample collection and identification

Environmental samples consisting of poultry droppings (25), goat droppings (25), pig droppings (20) Cow droppings (50) and fish ponds (30) were obtained randomly from various locations in Akure, Ondo State. The samples were kept in sterile universal bottles and transported to the Microbiological laboratory of Babcock University in an ice pack for processing. *Escherichia coli* were isolated and identified presumptively using eosin methylene blue agar.

Susceptibility testing

Phenotypic resistance status of the isolates was determined and interpreted using CLSI guidelines [14]. Briefly, pure culture of the isolates was standardized to match 0.5 McFarland standard. The suspension of the organism was streaked on Petri plate of Muller Hinton Agar (Oxoid, Hampshire, England) using sterile swab stick. The antibiotic disks were applied on the plates with a relative distance from each other and the edge of the plates. The plates were incubated for between 18-24 hours at 37°C. Zone diameter was measured with the help of a ruler. The antibiotic disk (Abtek Biologicals Limited) contained cefixime (5µg), amoxicillin/clavulanate (30µg), ciprofloxacin (5µg), nitrofurantion(300µg), gentamicin(10µg), cefuroxime(30µg), ceftazidine (30µg), and ofloxacin (5µg).

III. RESULTS AND DISCUSSION

Fifty none duplicate isolates of *E. coli* with metallic sheen were obtained of which all were resistant to amoxicillin/clavulanate (AUG) and 6%, 46%, 4%, 2%, 20%, 16% to cefixime, ciprofloxacin, cefuroxime, gentamicin, nitrofurantion and ofloxacin respectively (Table 1). Multidrug resistance was observed in among the species with 22% against eight antibiotics (Figure 1).

*Escherichia coli* is the most common cause of urinary tract infection (UTI) in humans and it’s the leading cause of enteric infections and systemic infection. The systemic infection includes bacteremia, nosocomial pneumonia. Antimicrobial resistance in *E. coli* has been documented as global problem and its susceptibility pattern shows a major geographical difference in environments. The results in this study revealed high level of resistance and is comparable to other studies [15-16]. The high resistance rate was observed in commonly used antibiotic such as the beta-lactams and this is consistent with
comparable studies in Ethiopia [17] and Nigeria [18]. The high resistance may be due to uncontrolled and spontaneous use of these antibiotics.

Most cases of multidrug resistance have been confirmed to be due to transferable extra chromosomal DNA, plasmids [19]. The multi-drug profile observed in this study has clinical implications; treatment failure in infected patients, prolong hospitalization and economic burden. Many pathotypes of E. coli have been implicated in infections of the gastrointestinal system while others cause infections other than gastrointestinal system [20]. The increasing drug resistance in E. coli is attributable to abuse of many antimicrobials especially in community where its use is uncontrolled. The application of antibiotics in animal husbandry might be responsible for the rising profile in environmental samples in this study. Consequently, an unprecedented surge in microbial resistance is anticipated in the nearest future if this trend continues unchecked.

IV. CONCLUSION

The result of this study showed high rates of multidrug resistance of E. coli strains in environmental samples. Hence regular antimicrobial surveillance is essential to minimize the proliferation of resistant E. coli in our environment. Policies should also be implemented and emphasis should be made on the reasonable use of antibiotics to prevent the spread of resistance in the environment.

Table 1: The percentage of the antimicrobial susceptibility pattern of E. coli obtained from environmental samples

<table>
<thead>
<tr>
<th>Antimicrobial drug tested</th>
<th>conc. per disc (μg)</th>
<th>Resistant isolates</th>
<th>Sensitive isolates</th>
<th>Intermediate isolates</th>
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Key: No- number of species

Figure 1: Multiple antibiotic resistance patterns of E. coli isolated from environmental samples

Key: CAZ= ceftazidime, CRX= cefuroxime, GEN = gentamicin, CXM = cefixime, OFL = ofloxacin, AUG (amoxicillin/clavulanate), NIT = nitrofurantoin, CPR = ciprofloxacin.

REFERENCES


