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A STUDY OF ANTIBACTERIAL RESISTANCE OF URINARY TRACT ISOLATES OF ESCHERICHIA COLI FROM BURDWAN MEDICAL COLLEGE, WEST BENGAL, INDIA.

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ABSTRACT:

BACKGROUND: *Today, every major class of antibiotic is associated with the emergence of significant resistance [1, 2], complicating the treatment of microbial diseases, including the urinary tract. In this scenario this study was important, especially in this part of the world, Burdwan Medical College, in Burdwan District, West Bengal, India, where previously no such study conducted.*
OBJECTIVE: *To study and to assess the resistance pattern among Escherichia coli from urinary isolates, in vitro study conducted as joint venture in the Department of Microbiology and in the Department of Pharmacology, Burdwan Medical College, West Bengal, India from September 2010 to April 2011.*
MATERIALS AND METHODS: *Bacteriology laboratory collected all the specimens of urine in sterile, leak-proof containers immediately, if there was delay, they were refrigerated for 5 hours before use. Midstream urine specimens from the patients of suspected UTI, on the basis of symptoms collected. The small amount of urine is inoculated in Blood Agar plate. They are then incubated overnight at 370 C temperature. Plates showing growth suggestive of significant bacteriuria, with colony counts more than 105 organism per ml.of urine. The organisms are identified by specific biochemical tests. The antimicrobial susceptibility testing done by disc diffusion method, where the organism is grown as a "lawn" on McConkay agar plate in the presence of anti microbial –impregnated disc. The organism is considered susceptible if the diameter of the zone of inhibition exceeds the predetermined threshold as recommended by the disc manufacturer. Antimicrobial – impregnated discs were used in our study as Amoxicillin, Amoxicillin-Clovulinic acid, Ciprofloxacin, Co-Trimoxazole, Gentamicin, Amikacin, Nitrofurantoin, Imipenem,Cephalexin,*
RESULTS: *E.coli was the most common uropathogen (74.15%) and 80.26% of*

E.coli showed resistance to amoxicillin, 69.74% % to amoxicillin-clavulinic acid, 9.21% to imipenam, 28.29 % to ciproflxacin, 9.87 % to nitrofurantoin, 79.61% to co-trimoxazole, 44.74 % to gentamicin, 11.85 % to amikacin, 59.87 % to cephalexin.
CONCLUSION: *These high rates of resistance indicate more rational and wiser use of chemotherapeutic agents to optimize the empirical therapy.*

KEY WORDS:
Antibacterial resistance, Urinary Tract Infection, E. coli, Sensitivity.

INTRODUCTION

Therapy for these infections is usually begun before results of microbiological tests as empirical therapy. The rationale for this empirical therapy is based on the highly predictable spectrum of etiological agents causing UTI and their antimicrobial resistance pattern. However, antimicrobial resistance among uropathogens is increasing [3]. Of the Enterobacteriaceae, the most rapid development of resistant is seen among E. coli [4].To bring international attention to a growing public health threat, World Health Organization (WHO) selected antimicrobial resistance as the theme for World Health Day 2011. Antimicrobial resistance is a threat to all branches of medical and public health practice. It challenges the control of infectious diseases, jeopardizes progress on health outcomes by increasing morbidity and mortality and imposes huge costs on societies [5].

Antimicrobial agents were viewed as miracle cures when first introduced into clinical practice. However, it became evident rather soon after the discovery of penicillin that resistance developed quickly, terminating the miracle. This serious development is ever present with each new antimicrobial agent and threatens the end of the antimicrobial era. Today, every major class of antibiotic is associated with the emergence of significant resistance [6, 7].

Two major factors are associated with emergence of antibacterial resistance; evolution and clinical or environmental practices. . A species that is subjected to pressure, chemical or otherwise, that threatens its extinction often evolves mechanisms to survive under that stress. Pathogens will evolve to develop resistance to the chemical warfare to which we subject them. This evolution is mostly aided by poor therapeutic practices by healthcare workers, as well as indiscriminant use of antibiotics for agricultural and animal husbandry purposes. Poor clinical practices that fail to incorporate the pharmacological properties of antimicrobials amplify the speed of development of drug resistance [8, 9].

The susceptibility patterns of uropathogens vary with geography. Different data of different region demonstrate a worldwide increase in the resistance of E. coli to antimicrobial agents commonly used to treat UTI [10, 11]. Since resistance rate vary by local geographic region, with individual patient characteristics and overtime, it is important to use current data when choosing treatment regimen [12].

In this perspective, the present study was important and conducted to assess the resistance pattern of E. coli in this part of the World, Burdwan District, West Bengal, India, where there is no previous such type of study, to create local regional data. It will guide the empiric treatment and ultimately will help the physician for the treatment of the patient.

MATERIALS AND METHODS:

It was a retrospective study. We analyzed 337 consecutive urinary sample obtained from patients admitted in various departments in Burdwan Medical College & Hospital,

West Bengal, India, from September 2010 to April 2011. The specimen was transported in sterile, leak-proof containers to the bacteriology laboratory immediately or if there was delay, refrigerated for 5 hours before use.

The detection of bacteria in a urine culture is the diagnostic "gold standard" for UTI. If the patient is symptomatic small number of organism is more significant. In asymptomatic patient more than 105 organisms per ml is usually regarded as significant [4].

Midstream urine specimens from the patients of suspected UTI, on the basis of symptoms, collected. The small amount of urine is inoculated in Blood Agar plate. They are then incubated overnight at 370 C temperatures. Plates showing growth suggestive of significant bacteriuria, with colony counts more than 105 organisms per ml. The organisms are identified by specific biochemical tests. The antimicrobial susceptibility testing done by disc diffusion method, where the organism is grown as a "lawn" on a McConkay agar plate in the presence of anti microbial –impregnated disc. The organism is considered susceptible if the diameter of the zone of inhibition exceeds the predetermined threshold as recommended by the disc manufacturer. Antimicrobial – impregnated discs were used in our study as Amoxicillin, Amoxicillin-Clavulinic acid, Ciprofloxacin, Co-Trimoxazole, Gentamicin, Amikacin, Nitrofurantoin, Imipenem,Cepha

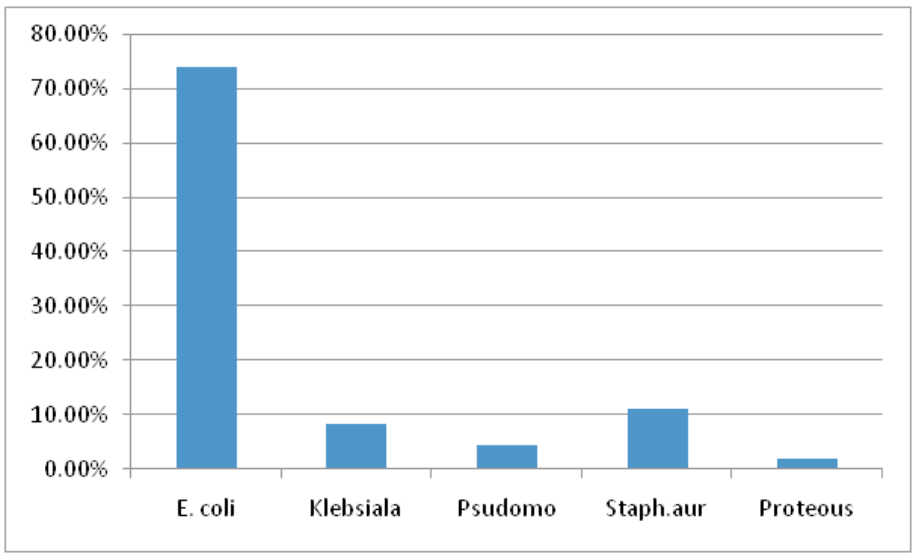
RESULTS:

Total 337 urine culture sensitivity report analyzed during that study period. Out of that 205 (60.83%) were bacterial culture positive. The most common organisms isolated in our study are shown in Table no: 1 and Bar chart diagram no: 1

Table no: 1 : Common Isolated Organisms from culture positive urinary specimen:

Organism	No. of organism	Percent (%) (n= 205)
Escherichia coli	152	74.15%
Klebseilla spp.	17	8.29%
Psedomonas spp.	9	4.39%
Staphylococcus aureus	23	11.22%
Proteous spp.	4	1.95%
Total	205	100.00%

Bar chart :1 Bar chart showing the distribution of isolated urinary pathogens as shown in table: 1 (n=205)



More than 90% of E coli isolates showed sensitive to imipenam and nitrofurantoin, where as more than 75% E. coli were resistant to amoxicillin and cotrimoxazole.The antibacterial sensitivity and resistant pattern of isolated E, coli are shown in Table no 2 and resistance pattern only shown in Bar chart no 2.

Bar Chart No: 2 showing the Resistance pattern of isolated (n=152) E.coli against antibacterial agents:

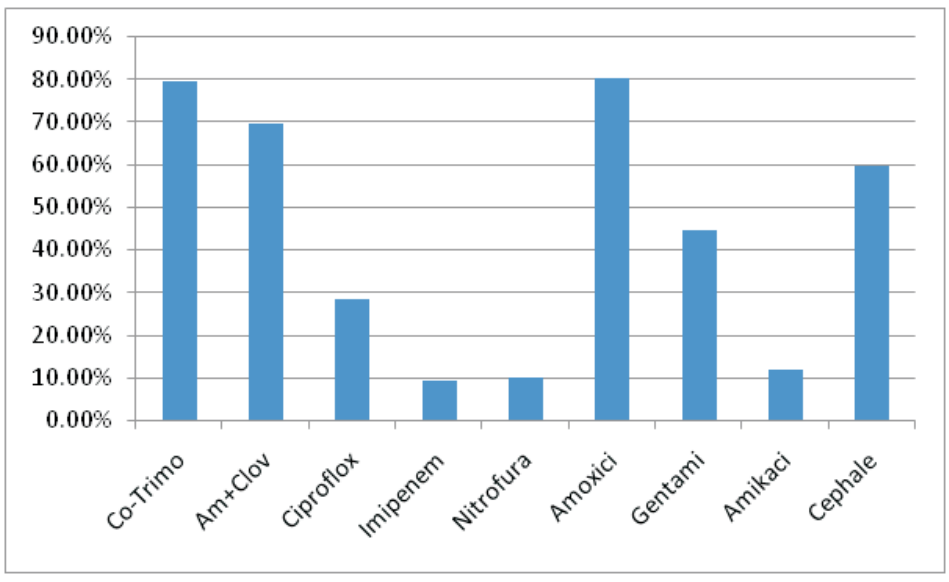


Table no 2: Sensitivity and Resistance pattern of urinary isolated E coli against antibacterial agent :

Antibacterial Agents	Sensitive (%) (n=152)	Resistant (%) (n=152)
Co-trimoxazole	31 (20.39%)	121 (79.61%)
Amoxycillin-Clavulinic acid	46 (30.26%)	106 (69.74%)
Ciproflxcacin	109(71.71%)	43 (28.29%)
Imipenem	138(90.79%)	14 (9.21%)
Nitrofurantoin	137 (90.13%)	15 (9.87%)
Amoxicillin	30 (19.74%)	122 (80.26%)
Gentamicin	84 (55.26%)	68 (44.74%)
Amikacin	134 (88.15%)	18 (11.85%)
Cephalexin	61(40.13%)	91 (59.87%)

DISCUSSION

Urinary Tract Infection (UTI) is the most common nosocomial infection [16]. E.coli, the Gram negative bacteria is an important cause of community acquired UTI, but resistance is seen in nearly 70-80 percent of the strains to the commonly used antibacterial agents [17].In our study highest resistance was found against amoxicillin (80.26%), next to co-trimoxazole (79.61%) and lowest seen against imipenem (9.21%) and nitrofurantoin (9.87%). In general, the high prevalence of resistance precludes empirical use of ampicillin and amoxicillin-salbactam, even in community acquired infection[11,12].The prevalence of resistance to 1st and 2nd generation cephalosporins is increasing among community acquired strains in the United States, with the current rates of 10%-40% and is even higher outside North America[4,18,19]. In our study 59.87% strains of E.coli were resistant to cephalexin.

` Resistance to nitrofurantoin remains low despite more than 60 years of use. Since this drug affects bacterial metabolism in multiple pathways, several mutational steps are required for the development of resistance. Nitrofurantoin is approved only for the treatment of urinary tract infections caused by microorganisms known to be susceptible to the drug.As stated in different report that, currently bacterial resistance to nitrofurantoin is more frequent than resistance to fluoroquinolones or co-trimoxazole, making nitrofurantoin a second-line agent for treatment of urinary tract infections. Nitrofurantoin is not recommended for treatment of pyelonephritis or prostatitis [20]. But in our study 9.87% of strains of E.coli were resistance to nitrofurantoin.

Most fluoroquinolones are highly effective for short-course therapy for cystitis; the exception is moxifloxacin, which does not achieve adequate urinary levels. The fluoroquinolones commonly used for UTI include ofloxacin, ciprofloxacin, and levofloxacin. The main concern about fluoroquinolone use for acute cystitis is the propagation of fluoroquinolone resistance, not only among uropathogens but also among other organisms causing more serious and difficult-to-treat infections at other sites. Fluoroquinolone use is also a factor driving the emergence of C.difficile outbreaks in hospital settings. Most experts now call for restricting fluoroquinolones to specific instances of uncomplicated cystitis in which other antimicrobial agents are not suitable The fluoroquinolones are potent bactericidal agents against E. coli [7]. The fluoroquinolones are significantly more potent and have a much broader spectrum of antimicrobial activity. Comparative clinical trials indicate that the fluoroquinolones are most efficacious for the treatment of UTI. Ciprofloxacin XR is FDA-approved

only for UTI [21].

The prevalence of resistance to fluoroquinolones has increased steadily over the last decade (e.g., from 5% to 20% in North America between 2002 and 2005 and from 8% to 25% among bacteremia isolates from the United Kingdom and Ireland between 2001 and 2006) and is even higher in other regions (Mexico, India). Prevalence figures are higher in when used as prophylactic ally [21, 7]. But in our study 28.29% strains of E. coli were resistant to Ciprofloxacin.

As for Cephalosporin resistance, data from the U.S. National Healthcare Safety Network (NHSN) indicated that just 6% of E. coli device-associated or surgical site infections were due to strains resistance to Cephalosporin III in 2006-2007 from the U.S. National Healthcare Safety Network (NHSN) indicated that just 6% of E. coli device-associated or surgical site infections were due to strains in 2002-2007 were resistant [19]. In our study 59.87% strains of E, coli were resistant to cephalexin.

Carbapenems (e.g., imipenem) and amikacin are the most predictably active agents overall, but carbapenemase-producing strains are on the rise (1–5% among health care–associated isolates) [22]. In our study, 11.85 % strains of E. coli were resistance to amikacin, 44.74 % were to gentamicin and only 9.21 % were resistance to imipenem- in our study this was found most effective as antimicrobial agent.

Different report suggested that aminoglycosides antibiotic (gentamicin, amikacin) resistant strains, fluroquinolone-resistant strains, cephalosporin resistant strains may result from consumption of meat product from animal treated with cephalosporin III and IV, fluoroquinolones and others [7,21].

CONCLSION

Although this evolving antimicrobial resistance is a source of serious concern, it is of equal important is the need to use the most appropriate narrower-spectrum antimicrobial agent whenever possible and to avoid treating colonized but uninfected patients so that the ever-escalating selection of increasingly resistant bacteria is not unnecessarily fueled.

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