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SULFONAMIDES/CO-TRIMAXAZOLE RESISTANT STRAINS OF ESCHERICHIA COLI CAUSING URINARY TRACT INFECTION

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ABSTRACT

Objective: To find out the frequency of sulfonamide resistant strains of Escherichia coli (E.coli) causing urinary tract infection.

Material and Methods: A cross sectional study was carried out to determine the resistant strains of E.coli to sulfonamide Co-trimaxazole at the laboratories of the Khyber Teaching Hospital, Peshawar and Pathology Department, Khyber Medical College, Peshawar from June 2008 to June 2010 which is catchment area for all of the Peshawar Town and its periphery.

Result: One Hundred and thirty six patients presenting with Urinary Tract Infection (UTI) complaints were investigated for E.coli infections by collecting the urine specimens. Urine culture and sensitivity (C/S) was done and the causative agents identified by routine microbiological examination and their sensitivity testing to Co-trimaxazole were performed. Out of 136 cases, 121 (88.03%) cases were resistant to sulfonamide (Co-trimaxazole) 15 cases (11.97%) were sensitive.

Conclusion: There is now a high incidence of sulfonamide (Co-trimaxazole) resistant urinary tract infections.

Key Words: Escherichia coli, urinary tract, infections, sulfonamides.

INTRODUCTION

Originally described and named by Theodore Escherich in 1885 bacterium-coli commune, later renamed Escherichia coli is a typical member of the Enterobacteriaceae, being a facultative anaerobic, short straight, Gram negative bacillus that is non sporing usually motile with peritrichous flagella, often fimbriate and occurs singly or in pairs rapidly growing in the liquid cultures[1]. Diseases caused by Escherichia coli are numerous and include urinary tract infection, septicemia and endocarditis[2].

Urinary tract infection is one of the most common infections observed in clinical practice among community and hospitalized patients[3]. The choice of antibiotic should depend upon the causative organism and their susceptibility pattern to various antibiotics[4]. Hence the knowledge on the frequency of the causative organisms and their sensitivity pattern requires reappraisal from time to time for effective treatment[5].

E.coli is the most common cause of urinary tract infections and accounts for approximately 90% of first urinary tract infections in young women. Symptoms and signs are as for any UTI and include urinary frequency, dysuria, haematuria, and pyuria. Urinary tract infection can result in bacteremia with clinical signs of sepsis[6].

Sulfonamides & Trimethoprim are man made drugs and are therefore, strictly speaking, not antibiotics, but synthetic anti bacterial agents. Sulfonamides (Co-trimaxazole) interfere with bacterial folic acid synthesis[1]. Sulfonamides are bacteriostatic drugs; they stop DNA synthesis and prevent cell division. Sulfonamides (Co-trimaxazole) are selectively toxic to bacteria because folate synthesis is obligatory in bacteria.

Bacterial resistance to Co-trimaxazole is altered so that it is no longer inhabitable by sulfonamides (Co-trimaxazole). Bacteria utilize salvage pathway which bypass 1-carbon synthesis of the bases. Genes for sulfonamide resistance are transferred by R-plasmids. Generally one resistance phenotype will confer resistance to all sulfonamides. Cross-resistance to sulfonamides and other drugs also occurs. Trimethoprim introduced in 1969 as a combination with sulfonamides, synergizes sulfonamide activity and minimizes bacterial resistance. Co-Trimaxazole: 1 part trimethoprim/5 parts Sulphamathaxazole. Clinical uses of sulfonamides are limited due to resistance problems. But addition of trimethoprim has greatly extended their usefulness, useful against most (Non resistant) Gram positive and many Gram-negative bacteria. Objective of the study is to determine the frequency of the

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resistant strains of Escherichia coli for sulfonamide (Co-trimaxazole) in patients presented with UTI.

MATERIALS AND METHODS

This study was carried out in Pathology Departments of Khyber Medical College and Khyber Teaching Hospital, Peshawar, Pakistan from June 2008 to June 2010. Urine samples of the different patients suffering from UTI were processed by using standard aseptic measures by routine Microbiological examination and the causative agents identified. E-coli was isolated by routine Microbiological testing like Grams staining, culturing on different media, Biochemical examination and culture sensitivity testing. Significant colony counts were obtained. The sensitivity of isolates was determined by applying discs of Trimethoprim-Sulphamathaxazole 1.25/23.75$^{\mu gm}$ and a zone of <10mm was identified as resistant according to CLSI criteria ref: (Clinical and Laboratory standard index- 2011). Control strains were used (E-coli ATCC 25922).

RESULT

Out of 136 cases, 121 (88.03%) were resistant to Cotri-maxazole and 15 cases (11.97%) were sensitive. The frequency of variables with percentages or shown in the Table 1:

Table 1: The frequency of resistant and sensitive E.coli strains from patient isolates

Variables	Samples with %ages
Total Resistant Cases	121(88.03%)
Total sensitive cases	15(11.97%)
Total Resistant Cases from females	79(65.21%)
Total Resistant Cases from males	42(34.79%)
Total sensitive cases from females	9(60%)
Total sensitive cases from males	6(40%)

DISCUSSION

In many developing countries, antimicrobials can be obtained freely from general shops instead of recognized medical stores and are taken without medical prescription. This leads to the inappropriate use of antimicrobials and their being taken at wrong dosages and for an insufficient length of time[9]. Lab staff facilities and trained staff are often not available to isolate the pathogens and perform sensitivity testing[10]. Guide lines in the selection of drugs and information about drug resistance are not communicated to those prescribing antimicrobials, especially in the rural areas[11]. There is a high frequency of resistance to sulfonamides (Co-trimaxazole), tetracycline, chloramphenicol, in the developing countries[12] as it is seen in our study also. The increasing ineffectiveness of the above drugs combined with the non-availability of alternative antimicrobial are contributing to the spread of major infectious diseases, and have been the cause of serious epidemics in recent years[13].

Bacteria usually become resistant to antimicrobials due to genetic mutation in binding site and by producing enzymes that inactivate antimicrobials. The genes that code for the production of resistant enzymes are carried on plasmids and can be transferred from one species to another[13]. The frequency of sulfonamide (Co-trimaxazole) resistance increase from 1986-1988 sharply (from 25.4% to 74.7%)[14]. Resistance to Trimethoprim was higher than to the other drugs in 1996 but did not increase substantially in the subsequent years[15]. This drug is heavily used in the Health Institutions and in the community, generally in combination with suphamethoxazole[16]. The selective pressure generated by over used explains the relatively high frequency of resistance in E-coli[17] which is comparable to 88.03% resistance in our study.

The altering of the permeability of the bacterial cell membrane makes it difficult for antimicrobials to inter to the membrane. The overuse of antibiotics along with poor hygiene and infection control (risk factors for antibiotics resistance in bacteria) are highly frequent in the developing countries[19]. Suboptimal sanitary conditions and over crowding in the students hostels may facilitate the spread of these resistance organism. Levy etal have observed rapid increases in the prevalence of resistance in the commensal normal flora E coli to the most of the older less expensive antimicrobial drugs like sulfonamides use in the management of infection in the developing countries [20].

Not only are these strains potential causes of infections but also they are the potential reservoirs of resistance genes that could be transferred to pathogen. For this reason trends seen with the commensals E coli may also occur with pathogenic organism [19]. Some studies showed that the trend in the enteric pathogenic E coli is towards in the increasing antibiotics resistance orders. The study emphasizes the need to monitor commensals as well as pathogen by susceptibility testing to guide treatment needed to conserve the usefulness of remaining drugs [21].

The purpose in this study is to look through the E coli resistance to co-trimaxazole which was the only pathogenic bacteria to cause urinary tract infections. 121 (88.03%) cases out of 136 samples of urine

developed resistance to co-trimaxazole showed similarities to most studies taken from other areas as the resistance was in the increasing orders to co-trimaxazole. The impacts of indiscriminate use of co-trimaxazole are:

1. There is increase level of resistance of E coli to co-trimaxazole among the communities with out proper investigation of the microbes.
2. The plasmids carrying the resistant genes are transferred from one cell to other bacterial cells.

CONCLUSION

The Escherichia coli involved in the UTI still shows maximum sensitivity to amino glycosides but the indiscriminate use of sulfonamides (Co-trimaxazole) has resulted in high frequency of resistance.

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