

Emergence of Multi Drug Resistant *Escherichia coli* strains Isolated from Urinary Tract Infection in Iranian Children's

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(Received: September 08, 2011; Accepted: November 19, 2011)

ABSTRACT

A current phenomenon of great concern in the medical community in developing countries is raising multi drug resistant organisms, and their problems with curing the infections in children. Most urinary tract infection (UTIs) in children are monomicrobial, often caused by *Escherichia coli* (60 to 80 percent of cases). Infected children need more care because they threaten by death and for treatment of them expensive drugs should be used, so in this study we evaluated the multi drug resistant strains of *E. coli* isolated from urinary tract infection in Iranian girl childrens. Materials and Methods This laboratory search was performed in DEY laboratory in Isfahan .Totally 1027 samples, collected from urine samples of girl children, aged from 1 month to 10 years. After confirmation of urine culture which is expressive of urinary infection, gram stain and biochemical differential test was done for the isolates and then susceptibility of all of them to 3 different antibiotics was determined by standard disk diffusion method. Results From 1027 study sample, frequency of UTIs in girl children's was 5.35%. Seventy nine percent of the isolates were multi drug resistant strains. Conclusion The antibiogram patterns of isolates showed a high percentage of multi drug resistant phenotype among the *E. coli* strains. With regard to the present data and high percentage of multi drug resistant strains of *E. coli*, regular monitoring antimicrobial drug resistance in the different areas is necessary to prevent unsuitable utilization of drugs which is the most important cause of emerging multi drug resistant strains.

Key words: Multi Drug Resistant, *Escherichia coli*, Urinary Tract Infection, Girl Childrens.

INTRODUCTION

Normally, urine is sterile and it is usually free of bacteria, viruses, and fungi but does contain fluids, salts, and waste products. An infection occurs when tiny organisms, usually bacteria from the digestive tract, cling to the opening of the urethra and begin to multiply (Conway *et al.*, 2007, Foster., 2008, Justice *et al.*, 2006, Nicolle., 2008, U.S., 2008). The urethra is the tube that carries urine from the bladder to outside the body. Most infections arise from one type of bacteria, *Escherichia coli*, which normally lives in the colon (Conway *et al.*, 2007, Foster., 2008, Justice *et al.*, 2006, Nicolle., 2008, U.S. 2008, Wennherstrom *et al.*, 2000). The diagnosis of urinary tract infection (UTI) in young children is important as a marker for urinary tract abnormalities. It may be associated with life-threatening sepsis in the newborn (Lin ., 2008,

Schroeder *et al.*, 2005, Shaikh *et al.*, 2007, McGillivray *et al.*, 2005, Mori *et al.*, 2007). UTI is a bacterial infection that affects any part of the urinary tract. Symptoms include frequent feeling and/or need to urinate, pain during urination, and cloudy urine (Bladder, 2010). The main causal agent is *Escherichia coli*. Although urine contains a variety of fluids, salts, and waste products, it does not usually have bacteria in it (Adult 2005, Conway *et al.*, 2007, Foster., 2008, Justice *et al.*, 2006, Nicolle., 2008, U.S. 2008). When bacteria get into the bladder or kidney and multiply in the urine, they may cause a UTI. The most common type of UTI is acute cystitis often referred to as a bladder infection. An infection of the upper urinary tract or kidney is known as pyelonephritis, and is potentially more serious. Although they cause discomfort, urinary tract infections can usually be easily treated with a short course of antibiotics with all no significant difference

between the classes of antibiotics commonly used (Mori *et al.*, 2009, Smaill.,2007,Michael *et al.*, 2005, Warren *et al.*,1999, Zalmanovici *et al.*,2010).

UTI of the most common infections of childhood (Biggi *et al.*,2001). It distresses the child, concerns the parents, and may cause permanent kidney damage. The urinary tract is comprised of the kidneys, ureters, bladder, and urethra. A urinary tract infection is an infection caused by pathogenic organisms (for example, bacteria, fungi, or parasites) in any of the structures that comprise the urinary tract. However, this is the broad definition of urinary tract infections; many authors prefer to use more specific terms that localize the urinary tract infection to the major structural segment involved such as urethritis (urethral infection), cystitis (bladder infection), ureter infection, and pyelonephritis (kidney infection) (Lin .,2008, Schroeder *et al.*, 2005, Shaikh *et al.*, 2007, McGillivray *et al.*, 2005, Mori *et al.*,2007). Other structures that eventually connect to or share close anatomic proximity to the urinary tract (for example, prostate, epididymis, and vagina) are sometimes included in the discussion of UTIs because they may either cause or be caused by UTIs (Conway *et al.*,2007,Foster.,2008, Justice *et al.*,2006,Nicolle., 2008,U.S.,2008). UTIs are common, more common in women than men, leading to approximately 8.3 million doctor visits per year. Although some infections go unnoticed, UTIs can cause problems that range from dysuria (pain and/or burning when urinating) to organ damage and even death. The kidneys are the active organs that, during their average production of about 1.5 quarts of urine per day, function to help keep electrolytes and fluids (for example, potassium, sodium, water) in balance, assist removal of waste products (urea) and produce a hormone that aids to form red blood cells. If kidneys are injured or destroyed by infection, these vital functions can be damaged or lost. While some investigators state that UTIs are not transmitted from person to person, other investigators dispute this and say UTIs may be contagious and recommend that sex partners avoid relations until the UTI has cleared. There is no dispute about UTIs caused by sexually transmitted disease (STD) organisms; these infections (gonorrhea, chlamydia) are easily transmitted between sex partners and are very contagious

(Gould *et al.*,2010,Jepson.,2008, Modgil., 2006, Perrotta *et al.*,2008, Williams *et al.*,2006).

Multidrug-resistant organisms (MDROs), including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and certain gram-negative bacilli(GNB) have important infection control implications that either have not been addressed or received only limited consideration in previous isolation guidelines (Siegel *et al.*,2006). Increasing experience with these organisms is improving understanding of the routes of transmission and effective preventive measures. For epidemiologic purposes, MDROs are defined as microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents (Siegel *et al.*,2006).

Most cases of UTIs clear up after a few days of drug treatment, but more severe cases may require several weeks of treatment (Smaill.,2007,Michael *et al.*,2005, Warren *et al.*,1999, Zalmanovici *et al.*,2010).

Aims of present study was establish prevalence rates of urinary tract infection and emergence of multi drug resistant strains of *Escherichia coli* in urinary tract infection in Iranian girl children's.

MATERIAL AND METHODS

Clinical Isolates

A total of 1027 consecutive non-repeat culture isolates of urine cultures were obtained from urine clinical over a period of 24 months (April 2009 to December 2010). The isolates were identified on the basis of conventional microbiological procedures (Koneman *et al.*,2006).

Bacterial strains

Identification Bacteria was performed with microbiological methods e.g Gram stains, and biochemical tests with the BioMerieux database system and use of differential medium. (Jalalpour 2011),Washington *et al.*, 2006).

Multi Drug Resistant Detection

Antimicrobial susceptibility was determined by Kirby-Bauer disk diffusion method

as per CLSI recommendations. (CLS.,2004). Antimicrobial disks used were Nitrofurantoin, Cefprozime, Ciprofloxacin and Gentamicin.

Identification bacteria was performed with microbiological methods e.g Gram stains and biochemical tests with the BioMerieux database system and use of differential culture medium. In first step specimen grows on sheep blood and EMB agars then incubated at 37°C under aerobic conditions (Jalalpour *et al.*,2007,2009,2011, Washington *et al.*, 2006).

Culture Technique and Definitions

Urine cultures were routinely obtained on children younger than 10 years of age. Urine specimens were then sent to the microbiology laboratory in sterile containers by pneumatic tube. Urine was refrigerated, if not plated, within 10 minutes of receipt. Standard quantitative culture was performed by laboratory technologists. A loop calibrated to deliver approximately 0.001 mL was used to inoculate blood agar (Merck) and MacConkey (Merck) agar plates. All plates were incubated at 35°C and examined daily for growth for 2 days. A positive result was defined as growth of a single urinary tract pathogen at e^{10^4} CFU/mL (Kathy *et al.*,1998).

RESULTS

According to results, from 1027 study sample, frequency of UTIs in girl children's was 5.35%. Seventy nine percent of the isolates were resistant to tow or tree antibiotic. The predominant pattern among these strains included resistance to

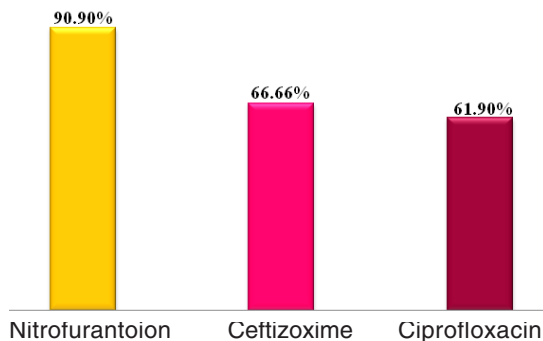


Fig. 1. Antibiogram pattern in multi drug resistant *Escherichia coli* strains isolated from urinary tract infection in girl children's

Nitrofurantoin (90.90%), Cefprozime (66.66%), Ciprofloxacin (70.069%) and Gentamicin (61.90%) (Fig 1).

Conclusion

A urinary tract infection is a condition where one or more parts of the urinary system (the kidneys, ureters, bladder, and urethra) become infected. UTIs are the most common of all bacterial infections and can occur at any time in the life of an individual. Almost 95% of cases of UTIs are caused by bacteria that typically multiply at the opening of the urethra and travel up to the bladder. Much less often, bacteria spread to the kidney from the bloodstream. Children with recurrent UTIs maybe treated with preventative antibiotics that decrease the rate of microbiological recurrence but not symptomatic recurrence. These conclusion must be viewed in light of the poor quality of evidence available (Gould *et al.*,2010,Jepson.,2008, Modgil., 2006, Perrotta *et al.*, 2008, Williams *et al.*, 2006).

UTI is one of the most common bacterial infections of childhood, affecting up to 10% by the teenage years (Coulthard *et al.*, 2001,Jakobsson *et al.*,1999). The incidence in infants is up to 1%, but as high as 10% in low-birthweight infants. It varies depending on age and sex. In the first year of life (mostly the first 3 months), UTI is more common in boys (3.7%) than in girls (2%), after which the incidence changes, to approximately 3% in girls and 1.1% in boys(Guidelines,2011). Paediatric UTI is the most common cause of fever of unknown origin in boys aged less than 3 years. 40% of children with UTI will have radiological abnormalities, e.g. reflux, malpositions, duplications, mega-ureter and hydronephrosis. New scars are common in all ages (Benador *et al.*,1997) During 2009/2010, 15,310 children under the age of 15 years were admitted to hospital in England with a primary diagnosis of UTI (Hospital Episode Statistics,2010).

Bladder infections are most common in young women with 10% of women getting an infection yearly and 60% having an infection at some point in their life (Nicolle,2008). Pyelonephritis occurs between 18–29 times less frequently (Nicolle,2008). According to the 1997 National Ambulatory Medical Care Survey and National

Hospital Ambulatory Medical Care Survey, urinary tract infection accounted for nearly 7 million office visits and 1 million emergency department visits, resulting in 100,000 hospitalizations (Epidemiology,2010). Nearly 1 in 3 women will have had at least 1 episode of urinary tract infections requiring antimicrobial therapy by the age of 24 years. The risk of urinary tract infection increases with increasing duration of catheterization. In non-institutionalized elderly populations, urinary tract infections are the second-most-common form of infection, accounting for nearly 25% of all infections (Epidemiology,2010). The condition rarely occurs in men who are younger than 50 years old and who did not undergo any genitourinary procedure. However, the incidence of urinary tract infections in men tends to rise after the age of 50.

According to statistics from 1990, the prevalence of urinary tract infections in pre-school and school girls was 1% to 3%, nearly 30-fold higher than that in boys (The epidemiology,2010). Also, the statistics from the same year show that approximately 5% of girls will develop at least one urinary tract infection in their school years.

In what concerns the symptoms of the condition, bacteriuria appears to increase in prevalence with age in women, still being 50 times greater than the one in males. It is estimated that bacteriuria will be experienced by 20 to 50% of older women and 5 to 20% of older men.

Community studies suggest that boys younger than 1 year of age and girls younger than 5 years of age are most at risk for UTI. The literature estimates that the prevalence of UTI in febrile children presenting for outpatient evaluation ranges from 1% to 20% (Crain *et al.*,1990,Hoberman *et al.*,1993, Kathy *et al.*,1998). The studies vary in their definition of UTI, method of urine collection, and eligibility criteria. Most have small sample sizes, and none have been true prevalence studies in which data are collected on all children (Kathy *et al.*,1998). Observational studies have found that UTIs have been diagnosed in Sweden in at least

2.2% of boys and 2.1% of girls by age 2 years, (Jakobsson *et al.*,1999) in 7.8% of girls and 1.7% of boys by age 7 years, (Hellstrom *et al.*,1991) and in the UK in 11.3% of girls and 3.6% of boys by age 16 years (Coulthard *et al.*,1997).

Frequent UTIs can damage the kidney and may eventually cause renal failure (the kidney can no longer remove waste products from the blood). People with renal failure may need dialysis (a machine cleans their blood) or kidney transplant.

Having a few infections is not enough to cause renal failure, but it is important to find out why the infection happened, because if there is a physical problem with the kidney, bladder or the tubes connecting them, treatment may prevent future infections, and possible renal failure (Gould *et al.*,2010,Jepson.,2008, Modgil.,2006, Perrotta *et al.*,2008, Williams *et al.*,2006). Appropriate hygiene and cleanliness of the genital area may help reduce the chances of introducing bacteria through the urethra. Females are especially vulnerable to this, because the urethra is in close proximity to the rectum. The genitals should be cleaned and wiped from front to back to reduce the chance of dragging *E. coli* bacteria from the rectal area to the urethra (Gould *et al.*,2010,Jepson.,2008, Modgil.,2006, Perrotta *et al.*,2008, Williams *et al.*,2006).

Monitoring and judicious usage of antibiotics, periodic surveillance of antibiotic resistance patterns, and efforts to decrease empirical antibiotic therapy would go a long way in addressing some of the problems associated with UTIs.

ACKNOWLEDGMENTS

The author sincerely acknowledge their gratitude to the management of DEY Laboratory in Isfanhan, Tohid St. Dr. Saeed Moayednia, Dr. Amir Farhad Kamkhah, Miss Hajiadineh, Miss Iravany and all dear ones who helped us conduct this research.

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