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PREVELANCE OF BACTERIA IN URINARY TRACT INFECTIONS AMONG CHILDREN

HASAN EJAZ, AIZZA ZAFAR, N. ANWAR, *T. A. CHEEMA, HUMAIRA SHEHZAD
Department of Microbiology, The Children's Hospital AND Institute of Child Health, Lahore
**Department of Botany, G. C. University, Lahore.*

The aim of the study was to identify the most common bacteria responsible for the UTI's among the hospitalized children of various sex and age groups. The study was carried out in the Microbiology section of The Children's Hospital & Institute of Child Health, Lahore during July to October 2004. A total of hundred positive samples were included in this study. The pure growth of bacteria was isolated by inoculating the specimens on Cysteine Lactose Electrolyte Deficient (CLED) Agar. The organisms were identified with the help of biochemical testing. The most frequently isolated organisms in this study were E. coli and Klebsiella (both 37%), followed by pseudomonas (23), Proteus, Staphylococcus aureus and Acinetobacter (1% each).

Urinary tract infection (UTI) is a general term referring to the infection (usually bacterial) anywhere in the urinary tract. It is generally accepted that infection of the upper urinary tract places the patient at risk for kidney damage, while lower UTI, although a cause of morbidity, does not cause renal damage.[1] Infections of the urinary tract are the most frequently encountered serious bacterial illness among febrile infants and children. They are second only to infections of the upper respiratory tract as infectious disorders for which medical intervention is sought. Almost all UTIs are ascending in origin and are caused by bacteria in the gastro intestinal tract that have colonized the periurethral area. After birth, the periurethral area, including the distal urethra, becomes colonized with aerobic and anaerobic microorganisms.[2] These organisms appear to function as a defense barrier against colonization by potential pathogens. Disturbance of the normal periurethral flora may occur when an upper respiratory tract infection is treated with a broad-spectrum antibiotic, predisposes to colonization of the periurethral area by potential uropathogens.[3] There are an estimated 150 million urinary tract infections per annum worldwide.[4] Warren et al reported that in the United States, urinary tract infections result in approximately 8 million physician visits per year.[5] Much of this increase has been related to emerging antibiotic resistance in urinary tract pathogens.[6]

The common uropathogens identified in patients with UTI include enteric gram-negative bacteria, with *E. coli* being the most common followed by *Proteus mirabilis*, *Klebsiella*, and *Enterococcus*.[7,8] In complicated UTIs, in addition to *E. coli*, there is a higher prevalence of *Pseudomonas*, *Enterobacter species*, *Serratia*, *Acinetobacter*, *Klebsiella*, and *Enterococci*.[9] Other aerobic gram-negative bacteria of the Enterobacteriacea family include *Citrobacter* and *Salmonella*.[10] The remainder of infections are caused by gram positive coagulase-negative s*taphylococcus saprophyticus*.[11,12]

Urinary tract infections can not be diagnosed on clinical grounds alone. The hallmark of a UTI has been the presence of a single microorganism of $\geq 10^5$ colony forming units (cfus) per ml in a clean-catch or midstream urine specimen, with lower numbers usually indicating contamination.[13] Studies of the general population have suggested lower colony counts for reasons which include: an early stage of infection, recent use of antibiotics, cleaning the perineum with an antiseptic, frequency of urination, urinary tract obstruction, state of hydration (including the time of day the specimen was collected), urine pH or specific gravity, or antibiotic therapy.[14] Pyuria is a term used to describe the appearance of increased numbers of ploymorphonuclear Leucocyte in the urine and it is an evidence of acute inflammation.[15,16] However, pyuria is not always associated with bacteriuria and its absence does not exclude infection.[17]

MATERIALS AND METHODS

The present study includes 100 positive cases of UTIs from the hospitalized patients in the Children's Hospital and Institute of Child Health, Lahore during July to October 2004. These included 52 females and 48 males and were in the age group of newborn to 15 years. Brief history of patients was obtained about frequency of

of micturation, retention of urine, burning micturation, fever and chills. The samples were collected in pre-sterile, dry, wide-mouthed and leak proof universal plastic containers. From the infants urine samples were collected by attaching plastic bags after careful cleaning of the genital area. In patients with indwelling catheters, the catheter well was disinfected near its junction with drainage tube and urine was collected by aspiration into sterile syringe. Samples were immediately transported to the laboratory where they were processed promptly.

1 ul (.001 ml) wire loop was sterilized and dipped into a urine sample. The loop was then streaked on the plate of Cysteine Lactose Electrolyte Deficient (CLED) Agar. The plates were incubated overnight at 37°C. Following the appearance of growth, well-isolated bacterial colonies were processed for antibiotic sensitivity and biochemical tests. The number of colonies on CLED plate was counted and viable count of bacteria was reported for each specimen.

For preliminary identification of bacteria the Gram staining, Catalase test, DNase and oxidase tests were performed. From the results of preliminary identification test, further biochemical tests were put up. The Gram negative rods were subjected to the following routine biochemical tests such as motility test, indole production, urease production, citrate utilization test and Triple sugar iron reaction. All organisms isolated were tested against various antibiotics *in vitro*.

Table 1: *Age distribution in males and females with UTIs (in 100 cases).*

Age groups (years)	Males	Percentage	Females	Percentage
0 – 1	1	2.08	0	0
2 – 5	25	52.09	24	46.2
6 – 10	18	37.5	18	34.6
11 – 15	4	8.33	10	19.2
Total	48	100	52	100

Table 2: *Frequency of different pathogens in UTIs.*

Organism	Male	Percentage	Female	Percentage
Gram Positive Cocci	0	0	1	1.92
Gram Negative Bacilli	48	100	51	98.08
Total	48	100	52	100

Table 3: *UTIs caused by lactose fermenters (LF) and non-lactose fermenters (NLF).*

Organism	Males	Percentage	Females	Percentage
LF	32	66.7	43	82.7
NLF	16	33.3	9	17.3
Total	48	100	52	100

RESULTS

When the data from 100 positive samples was organized in different age groups as well as gender wise, it appeared that the overall prevalence of UTIs in females was about 4% higher than males. In age group of 2-5 years, the prevalence of UTIs was higher in males than females, the males showed about 6 per cent increased risk of infection than females. For the age group 6-10 years again males showed about 3 per cent higher risk of infection than females. However, for 11-15 years age group, females were reported to have a two folds increase as compared to the males (Table 1).

Almost all of the cases of UTIs were due to the gram negative bacilli with no prominent sex difference (Table-2). Lactose fermenting (75%) bacteria showed predominant frequency in both sexes with 14.6 per cent higher frequency in females (57.3%) than of males (42.7%). Non lactose fermenting (25%) bacteria showed about two folds increase in males as compared to females (Table 3). The most frequent causative agents of UTIs in the study were found to be *E. coli* and *Klebsiella* (each 37%) followed by *Pseudomonas* (23%). *Acinetobacter*,

Proteus and *Staphylococcus aureus* were all 1% (Table 4).

Table 4: *Prevalence of UTI pathogens.*

Pathogens	No. of Cases	Percentage
E. coli	37	37
Klebsiella	37	37
Pseudomonas	23	23
Acinetobacter	1	1
Proteus	1	1
Staphylococcus aureus	1	1
Total	100	100

DISCUSSION

Almost all of the cases of UTIs were due to the gram negative bacilli with no prominent sex difference and most were due to lactose fermenting bacilli. The most frequent causative agents of UTIs in this study were found to be *E. coli* and *Klebsiella* (each 37%) followed by *Pseudomonas* (23%). *Acineto-bacter*, *Proteus* and *Staphylococcus aureus* were all 1% each. For many years, pathogens associated with uncomplicated UTIs have been reported to remain constant, with *E. coli* identified as the etiologic agent in about 75-90% of the infections.[18] Five to fifteen percent of uncomplicated UTIs are caused by *Staphylococcus saprophyticus*,[19,20] with *Klebsiella*, *Proteus*, *Enterococcus*, and *Pseudomonas* species seen in much smaller percentages.[21,22] Although the prevalence of different pathogens involved in UTIs is mainly of several population attributes, sample size and hygienic conditions of the patients. Therefore stable pattern in this regard cannot speculate, that is the reason that varying data are seen when different studies are compared.

E. coli has been indicated as the most frequently isolated pathogen of UTIs in many studies. For instance, in a retrospective analysis of UTIs isolates revealed that 90.12% of isolates were *E. coli* followed by *Klebsiella* (7.72%) and *Staphylococcus* (1.24%).[23] *E. coli* was the most frequently isolated pathogen in 1996 to 2001 years, during a study on catheter associated UTIs in a UK hospital. These workers found that *Enterococcus* was the second most frequent microbe [24]. The results of this study are in accordance with most of the studies done by others mentioned above; *E. coli* and *Klebsiella* being the main etiologic agents in UTIs. The reason for increased frequency of *Klebsiella* in UTIs may be the result of nosocomial infections.

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