International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 3; March 2018; Page No. 157-159

Prevalence of bacterial pathogens causing UTI in a tertiary care hospital

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Abstract
Introduction: UTI is a infection known to be responsible for majority of the cases and hospital admission in childhood. The presence of organisms responsible for UTI vary considerably from settings to settings. Also with the increased use of antibiotics, the organisms responsible have been constantly changing in proportions with varying levels of resistance. This study was done to assess the common uropathogens in our settings, so that further steps can be taken towards rationalising treatment protocols.
Methods: The study was carried out in Hi Tech Medical College where 323 patients formed the study sample. Their urine samples were sent for culture sensitivity on basis of suspecting UTI based on urine routine – microscopy reports.
Results: *E. coli* was found to be the most common organism isolated with the prevalence with 48.2% followed by enterococcus with 20.8%. Girls showed higher culture sensitive- positivity compared to boys.
Conclusion: There is *E. coli* preponderance in our area, but the prevalence is much lesser compared to previous studies carried out in this locality. The predilection towards girls has remain unchanged.

Keywords: culture, uropathogen: UTI

Introduction

Urinary tract infection (UTI) is one of the most common bacterial infections occurring in childhood. As per present data almost 150 million cases of UTI get diagnosed each year, with a varied prevalence ranging from 2-9 percent [1]. The probability of having a single episode of UTI before completeing 14 years of age is around 1 to 3 percent in boys and ranges from 3-10 percent in girls. Growth of a significant number of microorganisms (uropathogens) of a single species in the clean-catch mid-stream urine sample, along with the presence of symptoms are suggestive of UTI. The diagnosis of UTI is difficult and underdiagnosed in infants and young children, as urinary symptoms are not florid, and non-specific in many instances. UTI in infancy should be thoroughly evaluated with investigations including ultra sonography, micturating cystourethrogram and DMSA scan.

Antibiotic use as the primary treatment modality for a minimum of seven days is recommended for UTI presenting with fever. Based on the severity and toxicity the decision to manage the patient in inpatient department may be taken. For the stable patient who don't show any signs of feed intolerance, and persistent vomiting, oral antibiotics may be started as first line treatment. Infants under two years of age should be further assessed by a KUB ultrasound to identify any significant renal damage. UTI forms a differential for children presenting with fever without a focus, especially in infants under 2 years of age. It is usually a component of early or late onset neonatal sepsis and presents with hyperthermia, vomiting, irritability, lethargy, seizures, excessive cry and jaundice. Complicated UTI case presents with fever>39degree centigrade, abdominal pain, vomiting, dehydration, renal angle tenderness, raised creatinine, systemic toxicity. Children beyond the neonatal period present with recurrent fever, diarrhea, irritability, abdominal pain or flank pain and failure to gain adequate weight. Older children show fever, pain while micturition, burning sensation, urgency, hesitancy, increased frequency and abdominal or flank pain. UTI if not diagnosed and further not treated can give rise to structural changes in the kidney in form of renal scarring if associated long term. This makes it even more important for the doctors to identify, intervene and halt the progression of UTI, from reaching complications like hypertension and renal failure. A few studies have defined urinary tract infection as the most common form of bacterial infection [2, 3]

Escherichia coli, as a pathogen is responsible for 3/4th of the cases diagnosed, being the most common etiological pathogen even in adults. Klebsiella species, Proteus, Enterobacteriaceae, Staphylococcus saprophyticus and Enterococci are also responsible for UTI [4]. Predominantly UTI are attributed to a single bacterial species [5]. As per definition significant bacteriuria is defined by occurrence of more than 100000 organisms per cc in a sample of clean catch midstream urine. The anatomical predisposition of urethra in respect to the anal orifice, vaginal colonisation, and ineffective hygiene among children predisposes young girls to UTI, thus highlighting the differences based on age and gender [6].

The diagnosis of UTI among children by a normal urine analysis should be supported by positive cultures for uropathogens to confirm the presence of the infection [7]. In our setting culture sensitivity takes at least 3 -4 days for authentication. Meanwhile the use of empirical treatment is a routine followed in most settings [8, 9]. It is of common knowledge that the rampant and irrational use of antibiotics can give rise to multidrug resistant pathogens which may be difficult to deal with in the near future.

Knowing the cons of empirical antibiotic therapy leading to

the generation of antimicrobial resistance, a cautious approach towards antibiotic use must be emphasized [10, 11]. This study was carried out to know the common pathogenic organisms responsible for UTI in this geographic region and an attempt to streamline and narrow down the use of antibiotics in a judicious way

Materials and Methods

The study was carried out in our hospital Hi Tech Medical College and Hospitals from September 2017 to January 2018. Patients visiting the Out-Patient Department and admitted in the In Patient Department who showed more than or equal to 5 pus cells in the urine routine microscopy were included in the study. This was a non-interventional study where only routine procedure were carried out. Informed consent was taken from the parents before collecting urine samples of the patients for culture sensitivity. The parents who did not give consent for the sampling or those who had taken any antibiotics in the prior 6 months or those with multiple pathogen in the culture sensitivity reports (suspecting contamination), formed the exclusion criteria for the study. A repeat sample was sent for the patients showing multiple uropathogens in the initial report, if consenting and were included subsequently.

During the study period 323 midstream clean-catch urine samples were collected from suspected patients of UTI (pus cells more than or equal to 5) attending OPD with a urine report from outside or advised urine routine-microscopy on our OPD basis, or those admitted in our hospital and prescribed urine routine microscopy for any justified reason. Culture – sensitivity for all patients were sent after informing the parents about the proper aseptic method to collect clean-catch midstream catch urine into a sterile container. A clean-catch midstream specimen is advised to reduce the chances of contamination by peri-urethral flora. Parents were made to wash the external genitalia with a mild soap and water prior to collection. After collection, the urine was sent to the lab within half an hour. The samples which couldn't be sent within the stipulated time were refrigerated soon after collection and maintained at 4 degrees centigrade for upto 12 hours. In case the sample stayed beyond twelve hours, it was discarded and a fresh sample was collected again for Urine culture sensitivity. All data were entered into SPSS. Frequencies and percentages were documented for categorical variables such as, name of organism and probability of isolation from both genders.

Results

A total of 323 cases of different age and sex those who fulfilled the inclusion criteria of suspected UTI were included in this study. Of 323 cases, 40.2% were male and 59.8% were female with females outnumbering males by a ratio of 1.48:1. Rate of isolation of microorganisms or culture positivity was 36.2% in male and 47.6 % in female. A total of 43% of subjects were found to have positive culture report. Table 1 and Table 2 show the gender distribution and gender predilection for uropathogen isolation.

E. coli was found in 48.2% subjects followed by enterococcus; 20.8% subjects in our study were found positive with enterococcus; staph saprophyticus and pseudomonas contributed 8.6% cases each. Only 5.9% cases were found to be positive with streptococcus. Klebsiella was found in 4.4% cases.1.4% cases were infected with acenatobacter and proteus each. Only 0.7% cases were found to be infected with candida. Out of total number of girls 54.3% were found to have *E. coli* in their urine culture report followed by 16.3% enterococcus infected cases.9.7% girls were found with pseudomonas positive urine culture report where as 8.7% girls were found staph. saprophyticus positive. Streptococcus positive cases amongst girls were 3.3%. 4.3% of girls had klebsiella in urine sample. Proteus was found in 2.3% girls. Acenatobacter were found in least number in our study i.e 1.1% of girls.

Maximum number of boys were found infected with *E. coli* i.e 36.2%. Enterococcus was found in urine culture of 29.8% boys being the 2nd most common cause of UTI in boys in our study. 8.5% boys were found to be staph. saprophyticus positive. Pseudomonas was found in 6.4 % boys. The third most common cause of UTI in boys was found to be streptococcus in our study i.e 10.6%. 4.3% boys were found positive with klebsiella. 2.1% boys were found with acenatobacter and proteus infected each. No boys were found to be infected with proteus in the study conducted by us in our setting

Discussion

Urinary tract infection has become an important cause of bacterial infection in all age groups. Forty-three percent of the sample in our study were culture positive which is in accordance with previous studies [12]. As discussed UTI is more common in girls than in boys and the results in our study are in accordance with this. Most of the studies done previously show *E. coli* as the most common organism which is detected [13]. Our study also shows a similar trend. Previous studies have shown the predominance presence of *E. coli* accounting to over 60% and this coincides with our study [14, 15]. The prevalence of the infection due to Klebsiella species accounted to 16% in another study, which is higher than our community corresponding to 4.4% [16] S. As per previous study, saprophyticus constitutes about five to ten percent followed by the other Gram negative rods [17]. Our study shows 8.6% which is well within this range.

Table 1: Sex distribution for detection of uropathogen in urine culture (n = 323)\

Gender	Sample size (n=323)	Culture positive samples	Culture negative samples and contaminated samples
Boys	130 (40.2%)	47 (36.2%)	83(63.8%)
Girls	193(59.8%)	92(47.6%)	101(52.4%)
Total	323	139 (43%)	184 (57%)

Contaminated samples were taken as those reports where multiple organisms were isolated and repeat culture were either not done (consent not given) or remained sterile. If the repeat culture showed single organism, it was included in the culture positive group.

Table 2: microorganisms detected with gender predilection

Microorganism	N (percentage)	Female (percentage)	Male (percentage)
E. coli	67 (48.2%)	50 (54.3%)	17 (36.2%)
Enterococcus spp	29 (20.8%)	15 (16.3%)	14 (29.8%)
Staph. saprophyticus	12 (8.6%)	8 (8.7%)	4 (8.5%)
Pseudomonas	12 (8.6%)	9 (9.7%)	3 (6.4%)
Streptococci	8(5.9%)	3 (3.3%)	5(10.6%)
Klebsiella	6 (4.4%)	4 (4.3%)	2 (4.3%)
Acenatobacter	2 (1.4%)	1 (1.1%)	1 (2.1%)
Proteus	2 (1.4%)	2 (2.3%)	0 (0)
candida	1(0.7%)	0	1(2.1%)

Limitation

There were a few limitations in our study which includes a) not including the samples with two organisms positive in culture; b) accepting outside urine routine-microscopy samples which met our criteria; c) not breaking down the samples into age specific groups; d) not being able to follow up the response to antibiotic which was chosen from the antibiogram for all the patients in the sample.

Conclusions

Though trend of microorganisms causing UTI more-or-less remain the same with a preponderance towards females, a rational approach must be ensured in choosing the antibiotics. *E. coli* was the most commonly isolated microorganism in our setting. Also Enterococcus species was found to be responsible for another major portion. A study emphasizing on culture sensitivity based on the choice of antibiotics pertaining to MIC is the need of the hour, in the respective geographical regions. Regular surveillance of the organisms in the hospital as well as community is needed

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