

Bacterial profile and Antibigrams in urinary tract infection

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Abstract: *Objective:* The main objective of the study is to find out the bacterial UTIs etiology in the locality of Sonapur, Assam, India and check the proper antibiotics, epidemiology especially high risk group as well as positivity rate by age wise sex wise etc. *Background:* Urinary tract infection (UTI) is an infection of the parts of urinary tract of the body. Urinary tract includes upper urinary tract and lower urinary tract. Where upper urinary tract consist kidneys and ureters and lower urinary tract consists bladder, prostate (in male) and urethra. Upper urinary tract infection is known as kidney infection or pyelonephritis where as lower urinary tract is known as bladder infection or Cystitis. UTI are mainly caused by either bacteria or fungus but the bacterial UTI are more common in comparison with fungal UTI. *Method:* Urine specimens were collected in sterile container for study to culture and sensitivity. Isolated organisms were confirmed by different biochemical tests and proper antibiograms were found out by dish diffusion methods or AST. *Results and conclusion:* Total 1402 numbers of specimens collected and tested and positivity rate of UTI showed 23.25 % (326/1402). *Escherichia coli (E. Coli)* was the most UTI causing bacteria followed by *Enterococci*, *Staphylococci*, *Klebsiella*, *Proteus* and *Enterobacter*. Female were more affected in comparisons with male. Adults especially age range 22-28 years were found in high risk. Tetracyclin recorded as most resistant antibiogram whereas chloramphenicol as sensitive. The antibiotics patterns may help the physician to treat in the locality.

Keywords: UTI, Etiology, Epidemiology, AST, Treatment.

Introduction

UTI is an infection of the parts of urinary tract of the body. The symptoms of UTI are mainly pain in urination, frequent urination, small amounts of urine, cloudy urine, red/pink/cola-colored urine, strong-smelling urine, pelvic pain (in women), fever etc. This may varies from patient to patient. UTI was described since ancient times in 1550 BC by Ebers Papyrus [1]. As at that time antibiotics were not developed and patients treated with herbs. The treatment with antibiotics started from 1930 [2].

Annually about 250 million people developed UTI [3]. This disease is more common in female in comparison with male [4]. There may be many causes, female has shorter urethra than a man, which shortens the distance and bacteria can easily travel to the bladder. Sexual behavior or sexually active female tend to have more UTIs.

Having different sexual partner increases the risk. Female uses diaphragms spermicidal agents which may increase the risk. After menopause, a decline in circulating estrogen causes changes in the urinary tract that make female more vulnerable to infection. Urinary tract infection may be developed due to poor hygiene, abnormality in urinary tract due to babies born or others, use of catheter, low immunity etc.

The infection of urinary tract may complicated, uncomplicated or asymptomatic UTI [5]. Though the morbidity of UTI is low in comparison with other health care associated infections the study is important to proper treatment and to reduce the antibiotics resistance [6]. Again there are chances of development of bacteremia from bacteriuria.

Material and Methods

The study was carried out in Microbiology laboratory of Sonapur, Assam, India. In this study we tried to detect the bacterial etiology, epidemiology, AST of UTI for better treatment of the patients of the locality. The study was carried out from 2017 January to December 2018.

All patients suspected as UTI by physician were included for our study. Patients were informed about the study. Morning midstream urine samples were requested or preferred before antibiotic administration. But which was not possible for all patients as some of the patients were already with antibiotics and some of the patients refused to come next day with morning midstream samples. In those cases random samples were collected. For those patients who were already with antibiotics we instruct them to wait to void urine till the next dose of antibiotic. All the patients were clearly informed to clean the genital area with soap before collecting the midstream urine.

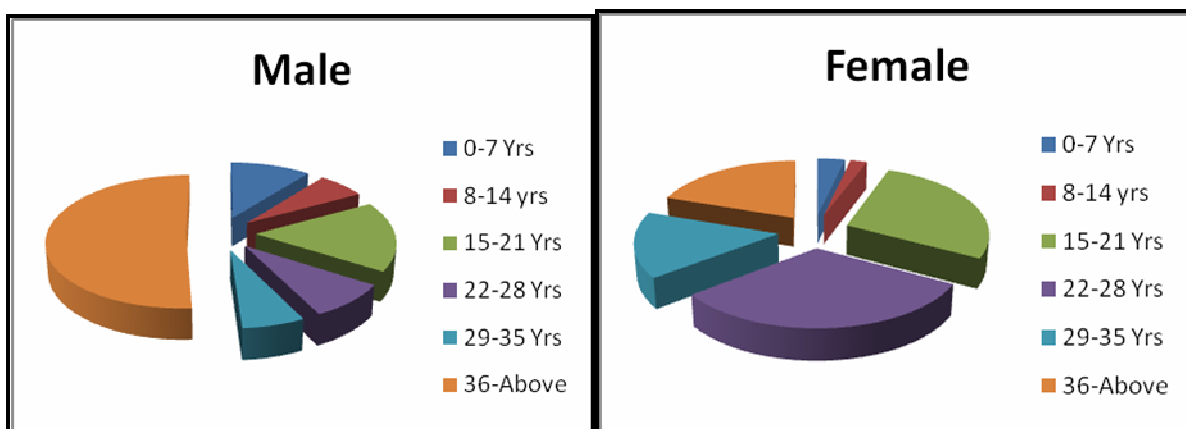
All samples were processed to test within one hour of the collection. Peptone water, UTI agar, MacConkey agar, Nutrient agar, Muller Hinton agar, Cled agar etc. media were used for isolation and sensitivity test. Antibiotic discs for sensitivity were used as per CSLI guidelines to check sensitive, resistant and intermediate antibiotics patterns. Which were measured by antibiotic zones scale. For confirmation of the bacteria isolated organisms were stained with gram stain

and as per cell wall nature (gram positive or gram negative) of the organism biochemical tests were selected. The gram positive organisms were confirmed by biochemical tests such as catalase test, coagulase test and the gram negative organisms were confirmed by biochemical tests like indole test, oxidase test, methyl red (MR) test, voges-proskauer (VP) test, citrate utilization test, triple suger ion (TSI) test, uresae test, and H₂S test etc. All the media, broth etc. for the isolation and sensitivity were prepared manually. After confirmation the data were analyzed.

Results

The study results showed that out of 1402 (One thousand four hundred two) 326 (three hundred twenty six) numbers of patients were reported as bacterial UTIs as per culture and sensitivity reports i.e. the positivity rate was 23.25%. Out of these 326 (three hundred twenty six) positive male female ratio was 1:17 (47/279). As per our analysis report 22-28 years age group was the high risk group after those 15-21 years follows 36-above years, 29-35 years, 0-7 years and 8-14 years. The sex wise analysis showed maximum infected male age group was 36-above years age group followed by the age groups 15-21 years, 0-7 years, 22-28 years and 8-14 years & 29-35 years. In female the maximum infected age group was 22-18 years which was followed by 15-21 years, 36-above years, 29-35 years, 0-7 years and 8-14 years (Figure1).

Fig-1: Affected age and sex analysis (Age range wise positivity)



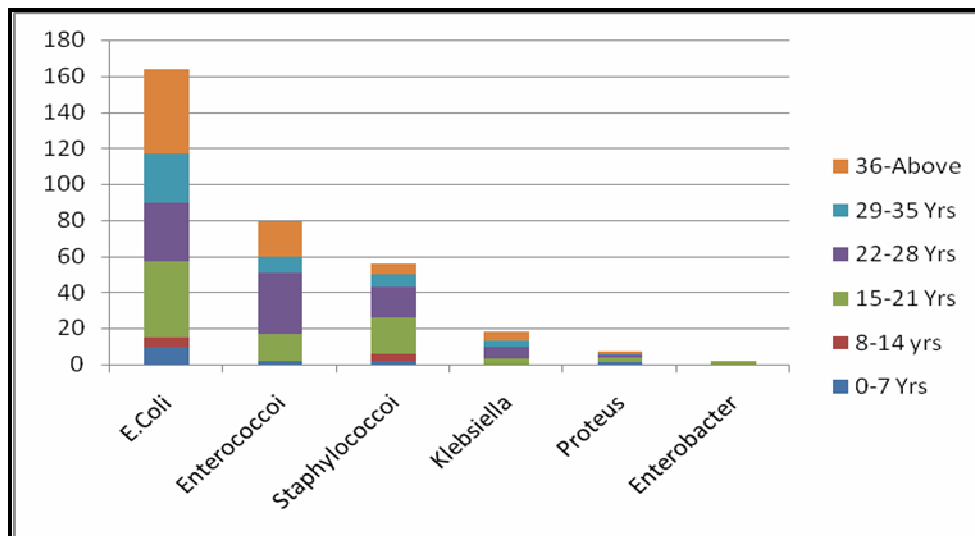
The bacterial strain analysis showed that maximum patients were infected by the bacteria *Escherichia coli*. The *Escherichia coli* positivity rate

was 50.3% (164/326). Maximum from 36-above years were infected by *Escherichia coli*. *Enterococci* positivity rate was 24.23% and

highly were from the age range 22-28 years. *Staphylococci* infected highly age range was 15-21 years and the strain isolated from all age groups positivity rate was 17.17%. *Klebsiella* isolated positivity rate was 5.52% and maximum

reported from the range of 22-28 years. *Proteus* isolation positivity rate was 2.14% and maximum contributed from 15-21 years. And *Enterobacter* infection reported only 0.61% (Figure 2).

Fig-2: Bacterial etiology of UTI



| Antibiotics list | Sensitive (in%) | Resistant (in%) |
|------------------|-----------------|-----------------|
| Chloramphenicol | 75% | 25% |
| Ceftriaxone | 73.61% | 26.39% |
| Amikacin | 70.83% | 29.17% |
| Nitrofurantoin | 69% | 31% |
| Co-trimoxazole | 65% | 35% |
| Ciprofloxacin | 63.19% | 36.81% |
| Amoxicillin | 60.42% | 39.58% |
| Levofloxacin | 60.42% | 39.58% |
| Cefazolin | 57.64% | 42.36% |
| Gentamicin | 56% | 44% |
| Norfloxacin | 54.87% | 45.13% |
| Cefuroxime | 49.30% | 50.70% |
| Clarithromycin | 33.34% | 66.70% |
| Ofloxacin | 33.34% | 66.70% |
| Erythromycin | 25.70% | 74.30% |
| Amoxyclave | 20.84% | 79.16% |
| Vancomycin | 18.75% | 81.25% |
| Tetracycline | 15.28% | 84.72% |

The antibiotics sensitivity patterns showed that maximum effective antibiotic as Chloramphenicol with 75% sensitivity. The other sensitive antibiotics were Ceftriaxone 73.61%, Amikacin 70.83%, Nitrofurantoin 69%, Co-trimoxazole 65%, Ciprofloxacin 63.19%, Amoxicillin 60.42%, Levofloxacin 60.42% Cefazolin 57.64%, Gentamicin 56%, Norfloxacin 54.87%, Cefuroxime 49.3%, Clarithromycin 33.34%, Ofloxacin 33.34%, Erythromycin 25.7%, Amoxyclave 20.84%, Vancomycin 18.75% and Tetracycline 15.28% (Table 1).

Discussion

Our analysis report showed maximum UTI causing organism as *Escherichia coli* which was found similar in a Medical college located in same district by Mohan DG et al., 2016 [7]. They studied in 2013 and our study was in 2017-2018. The same results i.e. maximum UTI causing *Escherichia Coli* also reported by another study in 2016 by Jadhav and Roushani [8]. Das M et al., 2016 found *Klebsiella* as second highest UTI causing organism after *Escherichia Coli* [9]. But in our study it was *Enterococci* after *Escherichia Coli*.

Another study of Sen AK et al., 2014 recorded 68.33% UTI infecting women and in our study it was recorded 85.58% women [10]. A study by Angami S et al., 2015 also informed in their study that UTI was higher in female (60%) in comparison with male [11]. These indicate that UTI high risk sex is female. Our analysis informed 22-28 years age range were high risk group which was found similar to the study of Thattil and Santhosh [12]. They report 26-35 years as high risk age group. But another study reported 60-above year's age range as maximum UTI affected age group [13].

A study by Sharma and Paul reported imepenem, cepefime, amikacin, norfloxacin, co-trimoxazole, ampicillin, ciprofloxacin and penicillin G etc. as most sensitive antibiotics [14]. In this study we found Chloramphenicol, Ceftriaxone, Amikacin, Nitrofurantoin, Co-trimoxazole, Ciprofloxacin as most sensitive antibiotics. Another article published in 2015 informed trimethoprim sulfamethoxazole, ciprofloxacin and ampicillin as most effective [15].

In our study we found only *Escherichia coli*, *Enterococci*, *Staphylococci*, *Klebsiella*, *Proteus* and *Enterobacter*. There are various studies found much more bacteria in their studies. Sharma, Laskar and Paul in 2014 isolated *Escherichia coli*,

Staphylococcus aureus, *Pseudomonas*, *CNS*, *Klebsiella*, *Proteus*, *Citrobacter*, *Micrococcus*, *Edwardsiella*, *Morganella*, *Enterobacter* etc [16]. In another research in 2019 reported *Escherichia coli*, *Staphylococci*, *Klebsiella*, *Proteus* and *Enterococci* as Urinary tract infections distribution [17].

From the analysis and comparisons of data it was clear that UTI may affect at any age group based on the living behavior, environment factors etc. Again, distribution of bacterial strain may also vary based on locality and prevalence. Effective antibiogram may directly relate to the isolated bacterial strain and female are the high risk sex group in comparison with male ratio.

Conclusion

Each patient's antibiogram patterns are different, each locality's bacterial distribution are also different. So, it is very important to perform individual test of each patient's for proper treatment, misuse of antibiotics as well as to reduce or control multi drug resistance. Government may plan for preventive strategies to control or minimize the disease. Researches or systemic study for development of best vaccine or reduce UTIs are also very important.

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