Global Advanced Research Journal of Microbiology (ISSN: 2315-5116) Vol. 8(2) pp. 035-037, March, 2019 Issue.
Available online http://garj.org/garjm

Review

Major trends in the microbial etiology of urinary tract infection

Ioana Florina Mihai[1], Alexandra Georgiana Lacatusu[1*], Florina Filip-Ciubotaru[1,2], Carmen Dorobat[1], C. Romanescu[1], Carmen Manciuc[1,2]

St. Parascheva Infectious Disease Hospital, Iasi
Grigore T. Popa University of Medicine and Pharmacy, Iasi

Accepted 26 March, 2019

Urinary tract infection (UTI) diagnosis is suggested by clinical findings (dysuria, pollakiuria) and confirmed by microbiological analysis of urine. Upon detection of pathogenic agents in the urine, antibiotic susceptibility testing (AST) should precede targeted antibiotic treatment. The growing prevalence of multiple resistant strains is a factor that poses serious challenges to antimicrobial therapy. Purpose: The aim of the study is to evaluate microbial resistance in patients with UTI's at the St. Parascheva Infectious Disease Hospital in Iasi, Romania. Results: Frequently occurring infectious agents in the lot included gram negative bacteria (GNB), Enterococcus sp. and Candida sp. A percent of 37.8 % of strains were beta-lactamase releasing. The authors also noted increased gram negative bacteria resistance to beta-lactams. Conclusions: The bacteria isolated in decreasing order by frequency were: Escherichia coli, Pseudomonas, Enterococcusand Enterobacter. In order to avoid the occurrence of pan-resistant strains, treatment should be preceded by AST and maintained for an adequate period of time.

Keywords: urinary tract infection, resistance, E. coli, beta-lactams.

INTRODUCTION

Urinary tract infection is a pathological state characterized by the contamination and multiplication of infectious agents in the urinary tract, expressed as bacteriuria. The colonization of urine may be symptomatic or asymptomatic, and the path of bacterial invasion could be ascending or hematogenous (rare). (Calandra and Cohen 2005).

The diagnosis of urinary infection is made by identifying the germs that caused the infection, requiring laboratory tests such as urine culture which is essential, and by urinalysis.

*Corresponding Author's Email: alexandra.lacatusu@gmail.com

Urinalysis (preferably obtained from the same sample as the urine culture) may be suggestive of an infection if: leukocyturia (>20 PMN/mm) and presence of the pathogenic organism in urinary sediment. (Coman et al,. 2008). However, urinalysis can neither confirm or exclude with certainty a diagnosis. Confirmation is obtained solely through urine culture.

Moreover, patients with recurring UTI's should undergo additional investigations such as kidney and urinary bladder radiography or urinary ultrasound. Abdominal ultrasound can reveal anatomical anomalies of the urinary tract, urinary tract obstruction (stones, tumours) and can exclude hydronephrosis or the existence of perinephric

abscesses. The abdominal radiography may reveal the presence of radiopaque stones. (Naber et al,. 2009).

The European Centre for Disease Prevention and Control (ECDC) reportson the etiological spectrum of urinary infections highlights a significantly increased percentage of *E. coli* strains, both for complicated and non-complicated infections. Other incriminated strains were Klebsiella sp., Proteus, Enterococcus, Pseudomonas, Serratia and others, in much smaller percentages.(4)

The treatment of ITU is established after obtaining the results of the paraclinical investigations, being individualized in accordance with the antibiotic result. There are cases in which there is a need to complete specific treatment with a supportive treatment, respectively with drugs that increase the antibiotic efficiency and reduce the risk of recurrence of urinary infection (eg phytopharmaceuticals with cranberry extract containing proanthocyanides, a substance that inhibits adhesion of bacteria to the urinary tract epithelium and blocks their multiplication).

After the treatment is complete, it is recommended to repeat urine and urine summary to check the efficacy of the treatment and the health of the urinary tract. (Wagenlehner and Naber 2004).

METHODS AND MATERIALS

The present study aims to identify the causative agents (including AST) isolated from in patients with UTI's at the St. ParaschevaInfectious Disease Hospital in Iasi between 01.01.2018 and 30.06.2018. We analysed the urine samples from the patients admitted in this 6 months that presented symptoms of UTI(fever, dysuria, polakiura)

RESULTS

During the above mentioned interval, urine testing was performed for 782 patients who displayed signs and symptoms of UTI (either at initial presentation, or during their admittance for other medical problem). In this lot, 267 patients had positive urine cultures.

According to the ECDC reports, during peak lifespan fertility for women (13-30 years of age),the presence of bacteria in the urine is 50 times more common in women, and also, it is estimated that 50% of women will experience an episode of UTI during life. Of the 267 UTI cases included in the study, 71% were female way more superior than male gender. Regarding the age group incidence, most cases were aged between 61-80 years(mean age being 65 years).

ECDC reported a 75% incidence of UTI as a consequence of urinary catheterise (Ronald 2003). Our study revealed catheter UTIs to represent 16.5 % of total UTI cases. Nosocomial UTI in our study accounted for about 31.8% of total cases. At the first admittance UTI patients accounted for 45.7% of participants, while recurring UTI cases only 6.1%.

Laboratory finding revealed co-infection (29 urine cultures revealed simultaneous infection with 2 different bacteria, 4 cultures with 3 bacteria). Regarding the causative pathogen, in 67% of patients we discovered gram negative species, 20% had Enterococcus sp. and 13% Candida sp.

Of the gram negative bacteria we obtained significantly statistical data. The results showed that 52.8% of the specimens were E. coli, followed in descending order by Klebsiella, Proteus, and Enterobacter. Compared with previous literature, these organisms had a lower frequency. A number of12 species of Enterobacteriaceae were beta-lactamase releasing (8 E. coli and 4 K. pneumoniae).

We choose to analyse the resistance of *E. coli* si *Klebsiella sp strains.*those beening found in a larger numer in our study group. From the microbiological data acquired we found that The highest resistance was for Ampicillin (68.6%), followed by Fluoroquinolone resistance at 52.32%, and Cephalosporine resistance at 44.2%. Uropathogenic *E. coli* had low resistance for Nitrofurantoin, Amikacin, and Gentamycin. For the strains of Klebsiella sp. isolated the highest resistance was to Fluoroquinolone (54,7%), followed by Amplicillin and Nitrofurantoin. Neither cases showed resistance to Colistin.

CONCLUSION

The etiologic spectrum of urinary tract infections in the studied group is wide, also meeting the plurimicrobianetiology, in some cases co-infection with 2 or more bacteria was present. A percent of 47% the urinary symptoms appeared in the first 72h after admittance and can be considered as healthcare associated infection.

The results showed that most of the strains were Escherichia coli strains, followed by Klesbiella spp., Pseudomonas, Enterococcus, Enterobacter species that were uncommon.

Urinary infections due to Candida strains were most likely influenced by the frequent and long-term use of antibiotics.

Treatment for UTI should be initiated according to AST and maintained for an adequate period of time in order to avoid pan resistance of the germs. Beta lactam resistant E. coli incidence was very high (especially for large spectrum Penicillin), while Klebsiella resistance was high mostly for Fluoroquinolones.

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