Research Article

Antibiotic Sensitivity of Uropathogens in Vesicoureteral reflux Children

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ABSTRACT

Vesicoureteral Reflux (VUR) is one of the most common urinary tract anatomical abnormality in childhood, which is associated with recurrent urinary tract infection . Our aim in this study was to investigate the most common uropathogens in UTI in children with VUR and their antibiotic sensitivity patterns. Urine samples were taken from 65 children who were diagnosed with VUR and UTI, from which uropathogens were isolated and identified by selective culture media and biochemical tests, and antibiotic sensitivity trends were evaluated on Muller Hington agar by disk diffusion method. *Staphylococcus aureus* was the leading isolate (23.7%) followed by *E.coli* (20.4%), *Klebsiella pneumonia* (17.2%), *Proteus mirabilis* (18%), *Enterococcus feacalis* (14.2%) and, *Pseudomonas aeruginosa* (6.5%). The highest sensitivity rates were against imipenem, amikacin, and nitrofurantoin (98.3%, 75.2%, 73.2% respectively), whereas the least were against augmentin and amoxicillin (37% and 9% respectively). Imipenem, amikacin, and nitrofurantoin were the most effective antibiotics, and higher resistance rates were found in younger children, who were suffering from more frequently recurrent infections.

Keywords: Vesicoureteral Reflux, Urinary tract infections, children, uropathogens, antibiotic, sensitivity.

INTRODUCTION

Vesicoureteral Reflux VUR is one of the most of urinary tract anatomical abnormalities found in children who suffer from recurrent urinary tract infections[1].

In healthy people, the ureters enter the urinary bladder obliquely and run submucosally for some distance[2]. This attachment helps to produce a valve like structure which keep the flow of urine from the ureters to the bladder in one way[2].

However, in VUR patients this structure is lost and the urine can reflux to the ureters and may be can up to the kidneys.

VUR is more common in young children(50% under one year) than in adults[3] , also is more common in male than in female (29% male versus 14% female)[4] .

VUR classified into five grades according to the height of reflux up of urine to the ureters and the degree of dilation of ureters[6].

VUR is associated with sever complications like renal scarring, renal failure, and acute pyelonephritis[6]. However the most symptoms of VUR is the recurrent urinary tract infections in children especially in young age, so our aim of study was to investigate the most common uropathogens that lead to recurrent urinary tract infections in children with VUR and their antibiotics resistance patterns.

MATERIALS AND METHODS

Urine samples were collected from 65 children with VUR associated with UTI, who were admitted to Children Hospital in Damascus, Syria, between September2012 and April 2013. The patients' ages were between 1 month and 4 years. We obtained samples either by midstream clean catch method from urination controlled children, or by urethral catheters from urination uncontrolled children. Children who had another infection or receiving antibiotics have been excluded from the study. Isolation of urine microorganisms was made on nutrient agar and next identification depended on gram staining, colonies characters on MacConkey, EMB and blood agar, in addition to biochemical tests like indole, methyl red-Voges Proskauer, Simmon's citrate, urease broth, oxidase, catalase and coagulase tests. We investigated the microorganisms' resistance rates against amoxicillin, augmentin, trimethoprim, sulfamethoxazole, cefoxitine, cefazoline, nitrofurantoin, ceftriaxone, gentamicin, amikacin, cefotaxime, ceftazidime, nalidixic acid and imipenem on Muller Hington agar by disk diffusion method.

Statistical analysis

SPSS program and Chi square test were used to analyze the results, which were presented as percentage rates (%). A P value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

65 patients had been classified into 3 groups according to their age, Group I: children under one year (41 patients, 45.1%), Group II: children between one and two years (18 patients, 19.9%) and Group III: older children more than two years (6 patients, 6.6%).

The girls (40%) were more than the boys (60%), however, 50% of Group I was only boys and the girls only increased after this age (100%), (P value<0.001). The reason for the

boys in this age group to have an increase risk was due having VUR. The same result is seen in Sedar T. et al[1], Conway Ph. et al[3], and Robert L. et al[4] study.

Among 65 urine sample, 122 bacterial isolates were found. In most of the samples we isolated only two bacterial types (80%) and the others we isolated are either one bacterial type (12.3%) or three bacterial types (7.6%). 55.4% of the infections with more than one bacterial type were in the Group I, whereas 18.5% of one bacterial type infections were all group, (P value=0.001). The increase in the isolates in children younger than a year old is explained by their weak immune response[5].

Staphylococcus aureus was the leading isolate in our study (23.7%), flowed by ***E.coli*** *(20.4%)*, ***Klebsiella pneumonia*** (17.2%), we also isolated ***Proteus mirabilis*** (18%), ***Pseudomonas aeruginosa*** (6.5%), and ***Enterococcus feacalis*** (14.2%), as it is described in the figure 1.

This variation in bacterial types isolated in our study may be explained by the presence of the defect in the valve like structure between the ureters and the bladder , which lead to cause the reflux of urine to the upper urinary system and facilitated the transition of urethral bacterial to the kidneys[6].

This result are similar to those in previous studies of Johanson et al[7], Park et al[8] and cascio et al[9], whom submitted the variation in bacterial types isolated from patients with UTI associated with VUR.

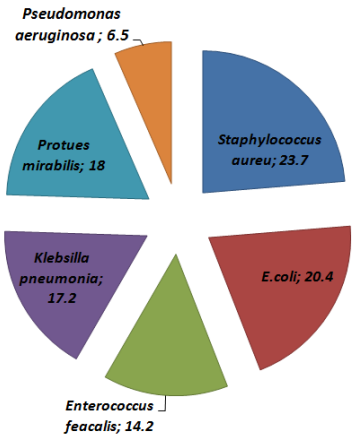

Figure 1: Types and percentage of bacteria isolated from VURchildren.

All bacterial types were isolated from all age groups, whereas the most variation was in the younger age (Group I), and described in figure 2, which may be explained by the recurrent use of urethral catheters due to the presence of VUR.

Which also had seen in Ghadge D. et al study[10], Johanson et al [7] and Park et al[8] studies.

Although sample are considered highly resistance because of the recurrence of the urinary tract infection, we investigated high sensitivity against imipenem, amikacin, and nitrofurantoin (98.3%, 75.2 %, and 73.2% respectively), as they are described in figure 3, which is explained by their limited and medically controlled use in our country. Similar high sensitivities against imipenem, and nitrofurantoin were reported in previous studies,[9,11,12] while lower sensitivities were found in others.[13-16] Although high amikacin sensitivity has been demonstrated in our study, the gentamicin sensitivity was much lower (30%) and lower than that reported in AL-Omar study in our country in 2008 (78%)[18] and in other regional studies (>60%).[12,13,19] This may be related to increase of gentamicin use, which will develop bacterial resistance and its tendency to prevent its intracellular accumulation up to the active level[20].

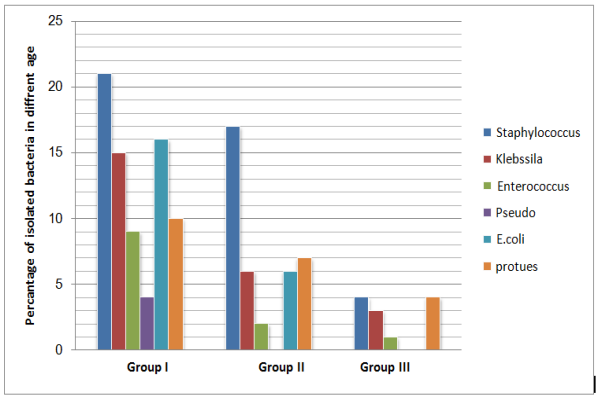

Figure 2: Distribution of bacterial type on age groups.

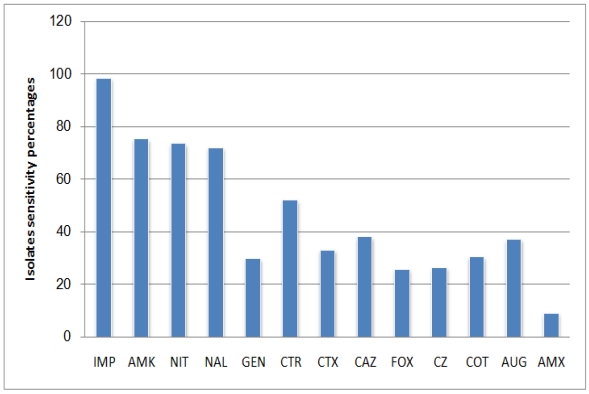

Figure 3: Percentages of isolates sensitivities against examined antibiotics.

IMP: imipenem, NAL: nalidixic acid, NIT: nitrofurantoin, AMK: amikacin, GEN: gentamicin, CTR: ceftriaxone, CTX: cefotaxime, CAZ: ceftazidime, FOX: cefoxitin, CZ: cefazoline, AUG: augmentin, AMX: amoxicillin and COT: trimethoprim and sulfamethoxazole.

Similar sensitivity decrease was found against cephalosporins, that was intermediate against ceftriaxone, ceftazidime (52%, 38% respectively), while was lower against cefotaxime, cefoxitin and cefazolin (33%,25.6%,26.4 respectively). Higher cephalosporins sensitivities were reported in AL-Omar study in 2005 (67-70%)[21] and in other regional ones(60-80%).[18,19,20] Decreased cephalosporins sensitivity may be a result from the development of resistance strains especially after the increase of their use in the treatment of nosocomial and

even community-acquired bacterial infections. The resistance rates against cefoxitine and cefazolin were even higher than that of other examined cephalosporins, because of their oral dosage forms which are more commonly used in children.

Sensitivities to trimethoprim and sulfamethoxazole, augmentin and amoxicillin were low (30%, 37%, 9% respectively), and they are not effective any more in the UTI with VUR treatment which is similar to what was demonstrated in many previous studies.[16,19,23,24] Amoxicillin and augmentin are rapidly excreted and the duration of their significant urine concentration is short,[22] in addition the bacterial resistance against them like that against trimethoprim and sulfamethoxazole is constantly increasing, because of the increase use without prescriptions in the treatment of bacterial infections or even the common cold.

CONCLUSION

There is a bacterial variation in UTI with VUR isolated patients. High sensitivity was found against imipenem, nitrofurantoin and amikacin, which promoted imipenem, and amikacin usage in the treatment of UTI with VUR. On the other hand, the highest resistance was found against cefazolin, cefoxitin, trimethoprim and sulfamethoxazole, augmentin and amoxicillin which are frequently prescribed for treatment in children. Therefore this status should be considered while prescribing these antibiotics for treatment and further studies are needed to follow the development of antibiotic resistance with time.

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