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Original Article

Urinary Tract Infections Caused By Group B *Streptococcus* in Adult Women: Survey of 11800 Urine Culture Results

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ABSTRACT

Background and Objective: Early diagnosis of *Streptococcus agalactiae* remains difficult, since symptoms are very nonspecific. Its frequency has not been completely investigated in urinary tract pathogen of pregnant ant and non pregnant women in Iran. The aim of this study was determining the frequency of Group B *Streptococci* in female patients.

Materials and Methods: A Total of 11800 urine specimens were received from female out-patients admitted during June till December 2010. Group B *Streptococci* isolates were confirmed by typical colony morphology, and identified by differential tests as well as by the growth characteristics in chromoagar. A provisional urinary tract infection diagnosis was defined by the presence of single group B *Streptococci* (>10 CFU/liter) with at least one of urinary tract infection symptom. Susceptibility testing was carried out by disk diffusion method.

Results: Of all specimens 498 specimens (4.22%) yielded significant bacteriuria caused by group B Streptococci. The mean age of these patients were 26.6 ± 19.37. Pregnant patients were 3.82% and the rest were non-pregnant. Antibiotic susceptibility test revealed that vancomycin, clindamycin and cefazolin had the lowest and penicillin showed the highest resistant rate.

Conclusion: Pattern on antibiotic susceptibility test showed high resistant rate to some antibiotic that made it difficult for pregnant patients, although its frequency was low. It was not possible to compare the antibiotic susceptibility pattern of pregnant women with non-pregnant because of the low number of pregnant women registered in this study.

Keywords: *Streptococcus* Group B, Urinary Tract Infection, Microbial Sensitivity Test

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Introduction

Group B *Streptococcus* (GBS) is a leading cause of serious infections in newborns, pregnant women and even in adults with chronic medical illness (1-3). It is reported recently as an important infectious agent of invasive disease in non-pregnant adults especially those underlying conditions such as diabetes mellitus, malignancy, or liver disease (4-5).

Recent studies revealed that rate of infection by GBS in adults continue to increase (6). GBS is a common normal flora of bowel and vaginal cavity and found some what less frequently in the urethra and throat (7), however colonization of GBS is highly prevalent among pregnant women and varying between 4% to 30%. The variation in rate of colonization may due to the sample collection site, the culture medium used for isolation of organism, the ethic group geographical location, immunological factors and the age of population studied (7).

In addition to maternal cervicovaginal colonization and neonatal meningitides and septicemia that results from vertical transmission of organism from mother to newborn.

CBS is a causative agent of urinary tract infections. The UTI caused by GBS in pregnant women may be asymptomatic bacteriuria or serious infection like cystitis, pyelonephritis urethritis and urosepsis.

Clinically UTI caused by GBS in many times may be indistinguishable from those caused by other organisms. However recent studies suggest that microbiological and clinical features may be different depending causative agent. Various rate of GBS UTI rate have been reported in pregnant and non-pregnant adults. GBS TUI rate have been different from 1% to up to one third and even more in these studies (8-12).

In this study we were going to evaluate the frequency of GBS in suspected female to UTI and to assess the activity of commonly used antibiotics.

Materials and Methods

Study period: This is a cross–sectional study carried out in Department of Microbiology of Milad Hospital. A total of 11800 urine specimens were received from female patients during June till December 2010.

Specimens: The specimens belonged to out-patients, those patients evaluated in the Emergency Department, and hospitalized in different wards of hospital. Urine samples were obtained as clean catch voided or catheterized samples from all patients who were subjected for assessment for UTI.

Isolation and Identification: All specimens were cultured routinely in Microbiology Laboratory and cultured routinely on Blood and EMB agar and were incubated at 35^{oC} for 24h (all media were provided from Merck Co., Germany). All significant isolates were identified using conventional microbiological methods (13).

All GBS isolates were confirmed by typical colony morphology, type of hemolysis, Gram stain, catalse test, CAMP reaction, Hipourate hydrolysis and growth characteristics in chromoagar (Chromagar Co, France)(Fig. 1).

Fig. 1- *Streptococcus agalactiae* on Chromagar (Cromagar Co.). *Strptococcus agalactiae* (GBS) appears in mauve and the other bacteria will be observed in blue color

In case where GBS cultured from urine with any count the medical record of each patient were reviewed for symptoms, demography data and pregnancy. A provisional UTI diagnosis was defined by the presence of single organism GBS bacteriuria (>10 CFU/liter) with at least one symptom that include dysuria, increase urine frequency and or urgency, fever >38^{oC} flank pain and/or lumber tenderness. In cases where urine analysis was performed, UTI was confirmed on the basis of positive urinary leukocyte esterase and pyruria.

Antibiotic susceptibility Testing: Susceptibility testing was carried out by disk diffusion method as recommended by CLSI (Antibiotic disks were provided from Mast Co.) (14). All GBS isolates were tested for resistance against penicillin, ampicillin vancomycin, ceftriaxone, cefotaxime, clindamycin and erythromycin

Quality Control and Standard Species: Briefly for the quality control of susceptibility tests *E. coli* (ATCC 25922), *Pseudomona aeruginosa* (ATCC 27853), *Staphylococcus aureus* (ATCC 25923) and *Enterococcus faecalis* (ATCC 929212) strains were used. A deceptive statistic was used for expression of data as a percentage using SPSS software (Version 16).

Results

Of the 11800 specimens processed during the study period, 498 (4.22%) yielded significant bacteriuria, of which 487 were out-patients and 11 were of those admitted patients. These cases were recorded among young and middle age with mean of 26.6 ± 19.37 years old. Those patients who were not in the age of pregnancy were 28.87%.

Nineteen patients (3.82%) were pregnant and the rest 479 (96.18%) were non pregnant. Hipourate hydrolysis and chromagar were positive in 495 cases while CAMP reaction was positive in all 498 cases.

Analysis of the collected data revealed that the highest sensitive rate was observed in vancomycin (84%) and the lowest was penicillin (10.6%) (Table 1). Sensitivity results of the rest antibiotics are presented in the Table 1.

Table 1: Sensitivity rate of Group B *Streptococcus* isolates to applied antibiotics (%)

	Penicillin	Ampicillin	Vancomycin	Ceftriaxone	Cefotaxime	Erythromycin	Clindamycin
Sensitive	10.6	47.8	84	56.2	53.4	49.6	65.8
Intermediate	-	-	-	-	-	26.2	17.4
Resistant	89.4	52.5	16	43.8	46.6	24.2	16.8

Discussion

At the present study, frequency rate of GBS was 4.22% among female patients engaging UTI. The mean age of the studied patients showed they were mostly in pregnancy ages, although a few patients (3.82%) were registered as pregnant patients. Antibiotic susceptibility was done by disk diffusion method that is a routine procedure in all laboratories. Use of E-test to evaluate the MIC of applied antibiotics gives accurate results, but we were not able to provide it in this study. However, quality control of the provided disks proved the reliability of all antibiotic disks. The analyzed results of antibiotic susceptibility test showed that isolated GBS was highly resistant to penicillin and about 50 percent to erythromycin. It is revealed that vancomycin had the lowest resistant rate among antibiotics tested. Low resistant of vancomycin had been also confirmed in the previous study (15). Analyzed result, proved resistant to cefotaxime and cefrtiaxon was observed in nearly about half the patients (46.6% and 43.8 respectively) that needs to be noted in any prescription of UTI infection (Table 1). Frequency of isolated GBS was nearly comparable in this study with other reports (16-18).

Our results showed that antibiotic resistant pattern was different than other studies reported from different part of the world. Simoes *et al.* (2007) reported characteristics of GBS and its antibiotic resistant pattern in female patients at Rio de Janeiro (Brazil) (19). He reported the highest resistant rate for gentamicin, while the highest sensitivity was for the penicillin, ampicillin, erythromycin and nitrofurantoin. The frequency of GBS resistance to penicillin showed 89.4 % in our study, that is remarkable very high, although the resistant rate of ampicillin was relatively lower the penicillin, but Simoes has reported higher sensitivity for the ampicillin.

In another study Sherk *et al.* (2009) evaluated the antibiotic sensitivity for UTI agent including GBS. They reported cephalexin was the most commonly administered drug in empirical therapy for acute uncomplicated cystitis, recurrent cystitis and urethritis in women. However, co-amoxiclav was suitable for acute uncomplicated pyelonephritis and complicated UTIs (20). Although Sherk isolated GBS in his study, but he did not specify the antibiotic resistant pattern for different bacterial agents. Therefore his results might not gives similar sensitivity results for various isolated microorganisms from urine.

In a study performed at the Taiwan, the antibiotic susceptibility was performed for a range of antibiotics. GBS rate was 15% in the studied patients that is more than three times higher than our study. Reported antibiotic susceptibility test showed azithromycin, clindamycin, erythromycin, ofloxacin, penicillin G, tetracycline, trimethoprim/sulfamethoxazole and vancomycin were sensitive 44.6%, 66.1%, 70.5%, 70.5%, 60.7%, 39.3%, 35.7%, and 100% respectively (21).

As it is obvious from the results of these above reports, antibiotic resistant rates show different pattern comparison with our study. It indicates that performance of antibiotic susceptibility test is necessary before any antibiotic prescriptions. According to the CLSI (N100 S21 version 2011 tables 2H1 page 100), specific antibiotic has not been recommended for urine isolates of non-pyogents *Streptococci*. However, it is mentioned ampicillin and cefazolin is recommended for the pregnant women in this table. Clindamycin and erythromycin can also be used if the pregnant patients who have allergic reaction to penicillin.

In this study, number of pregnant women

entered in this study was very few. Hence, it was not possible to compare the antibiotic susceptibility pattern of pregnant women with non-pregnant. Therefore a separate study for pregnant patients is required.

Unfortunately, as we understand from other reported, results of antibiotic susceptibility test underlined high resistant to penicillin that is important in those female with the UTI as noted in other studies (20-22). In our study penicillin was highly resistant to the isolated GBS from studied patients. Penicillin is the first choice for intrapartum prophylaxis, with erythromycin according to the recommendation of CDC and clindamycin as alternatives for penicillin-allergic patients. The high resistant rate for penicillin makes the physician to prescribe other antibiotic.

Conclusion: Frequency of GBS in female patient was low, although pattern on antibiotic susceptibility test showed high resistant rate to some antibiotic that is expected to be increase in future too. Non-pregnant patients were not facing with treatment failure because of available different susceptible antibiotics, but those who were pregnant may find some problem. However some other sensitive antibiotics are still available that can be prescribe for pregnant female patients such as clindamycin.

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References

1. Ulett KB, Benjamin WH, Jr Zhuo F, Xiao M, Kong F, Gilbert GL, *et al.* Diversity of group B *streptococcus* serotypes causing urinary tract infection in adults. J Clin Microbiol 2009; 47(7): 2055-60.

2. Akhlaghi F, Hamedi A, Naderi-Nasab M. Comparison of Group B Streptococcal Colonization in the Pregnant. Acta Medica Iranica 2009;47(2):103-8.

3. Abdollahi A, Moradi-Tabriz H, Mehdipour-Aghabagher B. Group B Streptococcal Sepsis in a Newborn: a Case Report. Iran J Pathol 2011;6(3):139-42.

4. Falagas ME, Rosmarakis ES, Avramopoulos I, Vakalis N. *Streptococcus agalactiae* infections in non-pregnant adults: single center experience of a growing clinical problem. Med Sci Monit 2006;12(11):447-51.

5. Santoro-Lopes G, Halpern M, Gonçalves RT. Perinephric abscess caused by *Streptococcus agalactiae* after renal transplantation. J Infect 2005;51(3):145-7.

6. Farely MM. Group B streptococcal disease in non-pregnant adults. CID 2001;33:556-61.

7. Foxman B, Gillespie B, Manning SD, Howard LJ, Tallman P, Zhang L, *et al.* Incidence and duration of group B *Streptococcus* by serotype among male and female college students living in a single dormitory. Am J Epidemiol 2006;15;163(6):544-51.

8. Edwards MS, Rench MA, Palazzi DL, Baker CJ. Group B streptococcal colonization and serotype-specific immunity in healthy elderly persons. Clin Infect Dis 2005;40(3):352-7.

9. Falagas ME, Rosmarakis ES, Avramopoulos I, Vakalis N. *Streptococcus agalactiae* infections in non-pregnant adults: single center experience of a growing clinical problem. Med Sci Monit 2006; 12(11):447-51.

10. Bliss SJ, Manning SD, Tallman P, Baker CJ, Pearlman MD, Marrs CF, Foxman B. Group B *Streptococcus* colonization in male and nonpregnant female university students: a cross-sectional prevalence study. Clin Infect Dis 2002; 34(2):184-90.

11. Toumi A, Ferjani A, Ben Abdallah H, Boukadida J. *Streptococcus agalactiae* in nonpregnant adults. Tunis Med 2006;84(3):161-4.

12. Nolla, JM, Gómez-Vaquero C ,Corbella X ,Ordóñez S ,García-Gómez C , Pérez A, *et al.* Group B *Streptococcus* (*Streptococcus* agalactiae) Pyogenic arthritis in nonpregnant adults. Medicine 2003;82(2):119-128.

13. Mandell GL ,Bennett JE ,Dolin R .The Clinician and the Microbiology laboratory .Principles and Practicee disease of infectious Disease. 5th ed. New York:Churchill Livingstone;2000.

14. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. Clinical and Laboratory Standards Institute. M100-S16. 2006, Wuane. USA.

15. Rahbar M, Hajia M. Farzanehkhah M. Activity of Nitrofurantoin against Urinary Tract Infections (UTI) Isolates of Vancomycin-Resistant Entreococci (VRE): Results of Three Years Survey in an Iranian Hospital. Iran J Pathol 2007; 2(4):171-4.

16. Zhanel GG, Hisanaga TL, Laing NM, DeCorby MR, Nichol KA, Weshnoweski B, *et al.* Antibiotic resistance in Escherichia coli outpatient urinary isolates: final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA). Int J Antimicrob Agents. 2006; 27(6):468-75

17. Al Benwan K, Al-Sweih N, Rotimi VO. Etiology and Antibiotic Susceptibility Patterns of Community- and Hospital-Acquired Urinary Tract Infections in a General Hospital in Kuwait. Int J Kuwait Uni Helth Center. 2010; 19(6): 440-446.

18. Bosch FJ, van Vuuren C, Joubert G. Antimicrobial resistance patterns in outpatient urinary tract infections - the constant need to revise prescribing habits. S Afr Med J 2011;:(5) 101.

19. Simoes JA, Alves VM, Fracalanzza SE, de Camargo RP, Mathias L, Milanez HM, *et al*. Phenotypical characteristics of group B *streptococcus* in parturients. Braz J Infect Dis 2007; 11(2):261-6.

20. Skerk V, Skerk V, Jaksić J, Lakos AK, Matrapazovski M, Maleković G, *et al.* Research of urinary tract infections in family medicine physicians' offices-empiric antimicrobial therapy of urinary tract infections-Croatian experience. Coll Antropol 2009;33(2):625-31.

21. Fu JC, Lin DP, Huang WJ, Huang CS, Yang CF. Antibiotic Susceptibility Pattern of Anovaginal Isolates of *streptococcus agalactiae* from Pregnant Women in Their Late Third Trimester. The Kaohsiung J Med Sci 2004;20(7):330-3.

22- Al Sweih N, Jamal W, Rotimi VO. Spectrum and antibiotic resistance of uropathogens isolated from hospital and community patients with urinary tract infections in two large hospitals in Kuwait. Med Princ Pract 2005;14(6):401-7.