

GROUP B STREPTOCOCCI URINE ISOLATES AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PROFILES IN A GROUP OF IRANIAN FEMALES: PREVALENCE AND SEASONAL VARIATIONS

Nasrin Shayanfar¹, Masoud Mohammadpour², Seyede Atefe Hashemi-Moghadam¹, Mohammad Taghi Haghi Ashtiani³, Ali Zare Mirzaie¹ and Nima Rezaei^{4,5}

¹Department of Pathology, Hazrate Rasoul-e-Akram Hospital, ²Children's Medical Center, Pediatrics Center of Excellence, ³Department of Pathology, Children's Medical Center, ⁴Research Center for Immunodeficiencies, Children's Medical Center, ⁵Molecular Immunology Research Center, Department of Immunology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

SUMMARY – *Streptococcus agalactiae* is one of the uropathogens responsible for urinary tract infections (UTI) in children, pregnant women, and elderly people with chronic underlying diseases. This study was performed to determine the prevalence of urinary tract isolates of group B streptococci (GBS) in a group of females referred to a referral University Hospital in Iran. In this retrospective cross-sectional study, urine analysis and urine culture results of all female subjects referred to the laboratory of the Rasoul-e-Akram Hospital, Tehran, Iran in 2010 were reviewed. Bacteriuria, colony count, pyuria and demographic data of patients were also evaluated. In this study, 10,256 females were investigated; 2061 (20.1%) of them had positive urine cultures. GBS was the isolated microorganism in 184 (8.92%) cases, yielding a prevalence of 1.79% in total study population. The mean age of subjects with positive GBS cultures was 48.24±18.8 years, with a higher prevalence recorded in the 51-60 and 21-30 age groups. The highest rates of cultures positive for GBS were seen in December and January. GBS was found to be sensitive to the following antibiotics: cephalothin (100%), norfloxacin (96.9%), ampicillin (96%), nitrofurantoin (95.5%), and vancomycin (95%). In this study, GBS showed greatest resistance to tetracycline (81.6%) and co-trimoxazole (68.9%). In conclusion, the prevalence of GBS in females with suspected UTI is relatively low; however, attention to the age and susceptibility pattern of antibiotic treatment for UTI caused by this microorganism is necessary.

Key words: *Streptococcus group B*; *Streptococcus agalactiae*; *Urinary tract infection*; *Antimicrobial susceptibility profile*

Introduction

Group B streptococci (GBS) are considered as one of the main causes of infections in neonates, pregnant women, and the elderly with chronic diseases^{1,2}. The

most common sites at which GBS are found are the vagina, especially in pregnant women, urinary tract and colon³. Bacterial colonization is seen in about 10% of non-pregnant women and 25% of pregnant individuals³, while approximately 60% of the neonates whose mothers had colonization of the bacteria remain colonized with the bacteria obtained from their mothers⁴.

Urinary tract infections (UTI) caused by GBS include asymptomatic bacteriuria, cystitis, pyelonephritis, urethritis and urosepsis⁵. Asymptomatic bac-

Correspondence to: *Nasrin Shayanfar, MD*, Department of Pathology, Hazrate Rasoul-e-Akram Hospital, Tehran University of Medical Sciences, Tehran, Iran
E-mail: nshayanfar@tums.ac.ir

Received February 27, 2012, accepted June 1, 2012

teruria caused by GBS is more common among pregnant women, while the cases who are at risk of cystitis by GBS are mostly the elderly and the patients with suppressed immune system^{1,6}. Although background pathogenesis leading to acute UTI caused by GBS is unknown, diabetes mellitus and chronic renal failure are considered as risk factors⁷.

There are only few and limited studies to determine the role of GBS in UTI in non-pregnant adults. Thus, the present study was conducted to investigate the prevalence of this microorganism isolated from urine of female individuals referred to the laboratory of Rasoul-e-Akram Hospital, Tehran, Iran, and to determine resistance and sensitivity of the bacteria to antibiotics.

Materials and Methods

This cross-sectional retrospective study included all females who had been referred to the laboratory of Rasoul-e-Akram Hospital for urine analysis (UA) and urine culture (UC) in 2010. The sampling method was a census; the samples that were positive for GBS were investigated thoroughly. All the subjects were required to collect the middle sterile part of the urine. The urine samples were cultivated on blood agar and MacConkey media. After 48 hours, the ones with pure culture of 10^3 or more colonies *per* mL were considered positive. Sensitivity of the microorganism to the antibiotics including ampicillin, cephalothin, cefazolin, tetracycline, nitrofurantoin, norfloxacin, co-trimoxazole and vancomycin was determined. Demographic information including the age of the subjects, the month and the season of performing the test, the number of bacteria and white blood cells (WBC) in the urine, resistance and sensitivity to antibiotics reported by UC were all recorded in a checklist.

Results

GBS positivity

In this study, 10,256 female subjects referred to the Hospital were investigated; 2,061 (20.09%) of them had positive urine culture, 184 (8.92%) positive for GBS, yielding a prevalence of 1.79% in total study population.

Seasonal variations

The highest rates of cultures positive for GBS were seen in December (21 cases, 11.4%) and January (21 cases, 11.4%), followed by July (20 cases, 10.9%) and August (19 cases, 10.3%), while the lowest rates were noticed in April (9 cases, 4.9%) and February (10 cases, 5.4%).

Age distribution

The mean age of the subjects with culture positive for GBS was 48.24 ± 18.8 years. The highest prevalence was recorded in the 51-60 (26.1%) and 21-30 (17.4%) age groups.

Colony count

The colony count of positive cultures was 10^3 in 13 (7.1%), between 10^3 and 10^4 in 65 (35.3%), 10^4 to 5×10^4 in 73 (39.7%), 5×10^4 to 10^5 in 15 (8.2%), and more than 10^5 in 18 (9.8%) cases.

Urinalysis

The number of bacteria counted in patient UA was as follows: rare in 57 (31%), few in 89 (48.4%), moderate in 29 (15.6%) and many in 9 (5%) cases. The mean WBC reported by UA of the patients positive for GBS was 6.6 ± 10.1 (ranging from 0 to 50). Most of the study subjects (154 cases, 83.7%) showed WBC count less than 10, 18 (9.8%) cases between 10 and 20, and 12 (6.5%) cases more than 20.

Antibiotic sensitivity report

The results of antibiotic sensitivity testing carried out to determine sensitivity and resistance to antibiotics in cases positive for GBS were as follows: the microorganism was most sensitive to cephalothin (100%), norfloxacin (96.9%), ampicillin (96%), nitrofurantoin (95.5%) and vancomycin (95%), while showing highest resistance to tetracycline (81.6%) and co-trimoxazole (68.9%) (Table 1).

Discussion

This study showed that positive culture for GBS was found in less than 2 percent of all female subjects and about 9% in all females with positive culture. A previous study by Munoz *et al.* on 24,906 urine sam-

ples over a period of 19 months showed that 4482 cases had positive culture; among them 22% revealed streptococcus species and GBS was isolated from only 92 (2%) cases⁷. In another study by Ulett *et al.* from 2009, GBS was detected in the urine culture of 387 (1.1%) out of 34,367 studied subjects⁵, which is in agreement with the results of our study.

Middle-aged women seem to be the most common group susceptible to GBS UTI⁷. The mean age of individuals positive for GBS was also 48 years in our study. Our study showed that only 10% of the patients had a colony count of more than 10⁵. In most of the cases, bacteriuria was less than moderate. Most of the subjects did not show pyuria. However, in the study by Munoz *et al.*, the GBS colony count was more than 10⁵ in urine culture of 63% of the subjects and urine analysis revealed pyuria in 60% of patients. The colony count of more than 10⁵ and pyuria were more common among symptomatic patients than in asymptomatic ones⁷. The cause of this difference could be attributed to the study population. In other studies, subjects with symptoms or signs of UTI were investigated; however, in this study, all cases that underwent UA and UC regardless of having or not having clinical manifestations were enrolled.

The present study indicated that GBS was sensitive to cephalothin, norfloxacin, ampicillin, nitrofurantoin and vancomycin; therefore, treatment with ampicillin or cephalothin was recommended. Resistance to tetracycline and co-trimoxazole has also been reported in other studies⁵. Developing an orientation towards antibiotic resistance might show colony distribution

Table 1. Antimicrobial susceptibility pattern of positive group B streptococcus isolates from urine cultures

Antibiotic	Susceptibility (%)	Resistance (%)	Total number
Tetracycline	33 (18.4%)	146 (81.6%)	179
Norfloxacin	157 (96.9%)	5 (3.1%)	162
Co-trimoxazole	57 (31.1%)	126 (68.9%)	183
Vancomycin	172 (95%)	9 (5%)	181
Nitrofurantoin	150 (95.5%)	7 (4.5%)	157
Cefazolin	105 (86.8%)	16 (13.2%)	121
Ampicillin	167 (96%)	7 (4%)	174
Cephalothin	45 (100%)	0	45

and horizontal transfer of resistance genes among GBS, which mostly happens in certain serotypes of GBS⁸.

In conclusion, GBS is considered as a urinary pathogen with a prevalence of 1.7% according to this study. This microorganism is mostly seen in middle-aged women, especially between 51 and 60 years of age. More than 90% of the cases with positive culture had a colony count less than 10⁵ and low bacteriuria and pyuria. The study revealed that GBS was sensitive to cephalothin, norfloxacin, ampicillin, nitrofurantoin and vancomycin, but resistant to tetracycline and co-trimoxazole.

References

- EDWARDS MS, BAKER CJ. Group B streptococcal infections in elderly adults. *Clin Infect Dis* 2005;41:839-47.
- BAKER CJ. Group B streptococcal infections. In: STEVENS DL, KAPLAN EL, editors. *Streptococcal infections. Clinical aspects, microbiology, and molecular pathogenesis*. New York: Oxford University Press, 2000;222-37.
- MANDELL GL. Mandell, Douglas and Bennett's Principles and practice of infectious diseases. 5th edn. New York: Churchill-Livingstone, 2000;2156-64.
- LARSEN JW, SEVER JL. Group B streptococcus and pregnancy. *Am J Obstet Gynecol* 2007;198:440-8.
- ULETT KB, BENJAMIN WH Jr, ZHUO F, XIAO M, KONG F, GILBERT GL, *et al.* Diversity of group B streptococcus serotypes causing urinary tract infections in adults. *J Clin Microbiol* 2009;47:2055-60.
- VERANI JR, MCGEE L, SCHRAG SJ; Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention (CDC). Prevention of perinatal group B streptococcal disease – revised guidelines from CDC, 2010. *MMWR Recomm Rep* 2010;59:1-36.
- MUÑOZ P, COQUE T, RODRÍGUEZ CRÉIXEMS M, BERNALDO de QUIRÓS JC, MORENO S, BOUZA E. Group B streptococcus: a cause of urinary tract infection in nonpregnant adults. *Clin Infect Dis* 1992;4:492-6.
- PUOPOLO KM, KLINZING DC, LIN MP, YESUCEVITZ DL, CIESLEWICZ MJ. A composite transposon associated with erythromycin and clindamycin resistance in group B streptococcus. *J Med Microbiol* 2007;56:947-55.

Sažetak

IZOLATI STREPTOKOKA GRUPE B U MOKRAČI I NJIHOVA ANTIMIKROBNA OSJETLJIVOST U SKUPINI IRANSKIH ŽENA: UČESTALOST I SEZONSKE RAZLIKE

N. Shayanfar, M. Mohammadpour, S.A. Hashemi-Moghadam, M.T. Haghi Ashtiani, A. Zare Mirzaie i N. Rezaei

Streptococcus agalactiae je jedan od uropatogena odgovornih za infekcije mokraćnog sustava kod djece, trudnica i starijih osoba s kroničnim osnovnim bolestima. Cilj ove studije bio je utvrditi učestalost izolata streptokoka grupe B u mokraćnom sustavu skupine žena upućenih u referentnu Sveučilišnu bolnicu u Iranu. U ovoj retrospektivnoj studiji obrađeni su rezultati analize mokraće i kulture mokraće svih ženskih osoba upućenih u laboratorij Bolnice Rasoul-e-Akram u Teheranu, Iran tijekom 2010. godine. Obrađeni su i podaci o bakteriuriji, broju kolonija, piuriji, te demografski podaci svih bolesnica. Od ukupno 10.256 ispitanih žena pozitivna kultura mokraće utvrđena je u 2061 (20,1%) žene. Streptokok grupe B bio je izolirani mikroorganizam u 184 (8,92%) slučajeva, dok je njegova ukupna učestalost u čitavoj ispitivanoj populaciji bila 1,79%. Srednja dob žena s pozitivnom kulturom streptokoka grupe B bila je 48,24±18,8 godina, s većom učestalošću u dobnim skupinama od 51-60 i 21-30 godina. Najviše stope pozitivnih kultura streptokoka grupe B zabilježene su u prosincu i siječnju, a mikroorganizam je pokazao osjetljivost na slijedeće antibiotike: cefalotin (100%), norfloksacin (96,9%), ampicilin (96%), nitrofurantoin (95,5%) i vankomicin (95%). U ovoj studiji je streptokok grupe B pokazao najveću otpornost na tetraciklin (81,6%) i kotrimoksazol (68,9%). Zaključuje se kako je učestalost streptokoka grupe B kod žena sa sumnjom na infekciju mokraćnog sustava relativno niska, međutim, pozornost treba posvetiti dobi bolesnice i profilu osjetljivosti antibiotske terapije za infekciju mokraćnog sustava uzrokovanu ovim mikroorganizmom.

Ključne riječi: *Streptokok grupe B; Streptococcus agalactiae; Infekcija mokraćnog sustava; Profil antimikrobne osjetljivosti*