

Antibiotic Susceptibility of Group A B-Hemolytic Streptococci Isolated From Tonsillar Swab Samples in 5-15 Years Old Children

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ABSTRACT

Tonsillopharyngitis is a common infectious disease in the pediatric age group. Group A Beta Hemolytic Streptococcus (GAS) is a main infectious agent of pharyngitis. Optimal therapeutic approach in these patients has been a matter of debate to avoid the complications of infection. The aim of this study was to investigate of antibiotic susceptibility for group A B-hemolytic Streptococci which isolated from tonsillar swab samples of 5-15 years old children. 2599 outpatient children who are 5-15 years old and have general infection symptoms like high fever, weakness, chills-shivering and observed hyperemia at tonsils and pharynx were included in the study. Tonsillopharyngeal culture and antimicrobial susceptibility tests were performed. 319 (12,3%) GAS isolates was obtained from tonsillopharyngeal cultures of the 2599 patients. Susceptibility to penicillin, vancomycin, linezolid, cefotaxime, erythromycin, chloramphenicol, and clindamycin were 100%, 100%, 100%, 100%, 97,2%, 98,3%, and 94,7% respectively. Resistance to penicillin was not yet observed, penicillin may safely be chosen to treatment of these infections for non-allergic patients to penicillin. It is considered that culture and antibiotic susceptibility testing may be more useful to for the diagnosis and treatment of these patients.

Key words: Streptococcus pyogenes, antibiotic, susceptibility, children.

Beş- Onbeş Yaş Grubu Çocukların Tonsil Sürüntü Örneklerinden İzole Edilen A Grubu B-Hemolitik Streptokokların Antibiyotik Duyarlılıkları

ÖZET

Tonsillofarenjit pediatrik yaş grubunda sık görülen bir enfeksiyon hastalığıdır. A Grubu Beta Hemolitik Streptokoklar (GAS) en sık farenjit etkenlerindedir. Bu enfeksiyonun komplikasyonlarını önlemek bakımından en uygun tedavi yaklaşımı tartışma konusu olmuştur. Bu çalışmanın amacı, 5-15 yaş grubu çocukların tonsiller sürüntü örneklerinden izole edilen A Grubu B-hemolitik Streptokokların antibiyotik duyarlılık oranlarının araştırılmasıdır. 5-15 yaş grubunda, yüksek ateş, halsizlik, üşüme-titreme gibi genel enfeksiyon belirtileri ile polikliniğe başvuran, bademcik ve farinkste hiperemi gözlemlenen 2599 çocuk hasta çalışmaya dahil edildi. Boğaz kültürü ve antibiyotik duyarlılık testleri yapıldı. 2599 hastanın tonsillo-faringial kültürlerinden 319'unda (12,3%) GAS izole edilmiştir. Penisilin, vankomisin, linezolid, sefotaksim, eritromisin, kloramfenikol ve klindamisin duyarlılık oranları sırasıyla % 100, % 100,% 100,% 100,% 97,2, %98,3 ve % 94,7 olarak bulunmuştur. Bu enfeksiyonların tedavisinde, penisilin dienci bulunmadığından, penisilin alerjisi olmayan hastalar için güvenle seçilebilir. Bu hastaların tanı ve tedavisinde, kültür ve antibiyotik duyarlılık testlerinin yapılmasının daha yararlı olabileceği düşünülmektedir. Anahtar kelimeler: Streptococcus pyogenes, antibiyotik, duyarlılık, çocuklar.

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INTRODUCTION

Tonsillopharyngitis is a common infectious disease in the pediatric age group. Group A Beta Hemolytic Streptococcus (*S. pyogenes*) (GAS) is a main bacterial infectious agent associated to pharyngitis. Optimal therapeutic approach in these patients has been a matter of debate to avoid the complications of infection. There are some complications of these infections including acute rheumatic fever (ARF), peritonsillar abscess (PTA), and rheumatic heart disease (RHD) (1-3). Some therapeutic approaches have been defined to this disease management. Treating the patients with pharyngitis without testing ensures some advantage, but this approach could have some complication such as risk of anaphylaxis, and use of irregular antibiotic has been associated to antibiotic resistance (1, 2). Observing the patients without providing testing or treatments are avoided the risks associated with use of antibiotic, but early treatment with antibiotics may prevent other rare complications of untreated GAS pharyngitis, including PTA, ARF, and RHD (1-3).

Ordering the therapy after testing the patients with pharyngitis with a rapid antigen test, nearly all patients with GAS pharyngitis are identified and treated, but some patients with GAS pharyngitis are missed. If physicians are adequate about test practice, the American Academy of Pediatrics (AAP) and the Infectious Diseases Society of America (IDSA) recommend this approach (1, 2). Performing of throat culture and antibiotics susceptibility tests has the advantage of diagnosis and treatment of GAS pharyngitis cases, but may be delay to initiate the treatment. These approaches are recommended by the Institute for Clinical Systems Improvement (ICSI), the AAP, and the IDSA (1-4). Selecting of antimicrobial treatment of group A streptococcal pharyngitis is an important issues. A number of antibiotics have used for treating group A streptococcal pharyngitis. Penicillin is the drug of choice for treatment of GAS pharyngitis. Erythromycin is alternative for allergic patients to penicillin, and macrolides, cephalosporins, clindamycin can be used in therapy. 10 days therapy is indicated except for azithromycin (5 days) and penicillin G benzathine (1 dose) (1, 5). The peak age incidence for GAS infections is between 5-15 years olds (6). Acute glomerulonephritis and ARF are non-suppurative sequelae of GAS disease in these patients. The main goals of antimicrobial therapy for this disease are to reduce morbidity, nonsuppurative sequelae, and transmission to close contacts (1, 2, 5). It was aimed to investigate prevalence of isolated *Streptococcus pyo-*

genes in patients who are 5-15 age groups children with tonsillopharyngitis, and to determine of susceptibility rate of isolated GAS to different groups of antibiotics.

MATERIALS AND METHODS

This study was carried out at the Department of Microbiology of Meram Medical School Hospital from January 2009 till December 2012 in Konya (Turkey) and assessed retrospectively. 2599 outpatient children who are 5-15 years old and have general infection symptoms like high fever, weakness, chills-shivering and observed hyperemia at tonsils and pharynx were included in the study. 1424 (54,8%) patients were female, and 1175 (45,2%) patients were male. Average ages were respectively 8,9 for patients, and 8,6 for females, and 9,3 for males.

During examination of patients, throat swabs were obtained from every patient using transport medium for cultur evaluation. After throat swabs were obtained, bacterial cultures were made within 2 hours by inoculating agar plates containing 5% sheep blood (Oxoid, Hampshire, United Kingdom) and incubated at 37°C for 20-24 hours. When the Beta hemolytic colonies were identified on the basis of 10 or more CFU on a blood agar plate, colonies suggestive of *B-hemolytic Streptococcus* were collected and subculture was performed a sheep blood agar slide (5%). Bacitracin disk (0.04 U, Oxoid) and trimethoprim-sulfamethoxazole (25 µg) disk were placed on the subcultured media. Gram positive, catalase and coagulase negative, susceptible to bacitracin, resistant to trimethoprim-sulfamethoxazole, and *B-hemolytic* colonies were identified as GAS (*Streptococcus pyogenes*). The determination of antibiotic susceptibility was performed by disk diffusion technique according to Clinical Laboratory Standards Institute (CLSI) criteria and were tested penicillin (10 unite), vancomycin (30µg), erythromycin (15µg), chloramphenicol (30µg), clindamycin (2µg), cefotaxime (30µg) and linezolid (30µg) (7).

RESULTS

In this study, 319 (12,3%) GAS strains was isolated from tonsillopharyngeal cultures of 2599 patients, and these bacteria were isolated in 154 (10,8%) of 1424 females and in 165 (14,0%) of 1175 males. All isolates were sus-

ceptible to penicillin, vancomycin, linezolid, and cefotaxime. Twelve isolates were resistant to erythromycin, five to chloramphenicol, and seventeen to clindamycin. Susceptibility to penicillin, vancomycin, linezolid, cefotaxime, erythromycin, chloramphenicol, and clindamycin were 100%, 100%, 100%, 100%, 97,2%, 98,3%, and 94,7% respectively.

DISCUSSION

GAS infections that cause tonsillopharyngitis are important infectious disease with regard to some complications of these infections in the pediatric age group. The diseases as ARF, RHD, and PTA are serious complications of these infections. Particularly in developing countries, these diseases remain significant public health problems (8). Pharyngitis with GAS and other infections have remained unchanged in both developed and developing countries (8). The clinical microbiology laboratory plays an essential role in rheumatic fever control programs, by facilitating the identification of GAS infections (8). Nordet et al. (9) shown that ARF and RHD can be prevented with prevention and control programs of ARF and RHD. To avoid complications of these infections, optimal therapeutic approach must be developed according to socio-economic states of countries. The correct diagnosis of illness is the first step for treatment approach. Performing of pharyngeal culture and antibiotics susceptibility tests have the advantage of diagnosis and treatment of GAS pharyngitis cases, and these approaches are recommended by the ICSI and the IDSA (1- 4). In this study, throat culture and antibiotics susceptibility tests were performed. In the performed throat culture, 319 (12,3%) GAS isolates was isolated in the specimen of tonsillopharyngeal swabs of the 2599 patients, and these bacteria were isolated in 154 (10,8%) of 1424 females and in 165 (14,0%) of 1175 males.

Santos et al. (10) investigated the frequency of GAS infections by rapid test, culture, and gene probe techniques and the culture was observed the most sensitive test. Omurzakova et al. (11) compared rapid antigen detection test with bacterial culture analysis and, bacterial culture analysis were observed to be more sensitive test. Morais et al. (12) reported that the prevalence of GAS were 7.7% (5/65) in the students from a private school. In the performed throat culture study between 1998-2002 years, the percentages of GAS-positive throat cultures were observed between 13,4% to 17,7% accord-

ing to study year (13). This study referred that the modest increase in the proportion of positive cultures was significantly different when year 3 was compared with years 1 and 4 (13). In a performed study, it is informed that throat carriage rates of GAS in spring, summer and winter were 13.0, 8.0 and 16.0 percent, respectively for children (14). GAS isolates were isolated in 39 (10,15%) of 386 patients who were 5-15 years old in throat cultures by Doğan et al. (15). Our study is similar to these studies in terms of GAS isolation ratio.

In the performed antimicrobial susceptibility tests, susceptibility percentages of penicillin, vancomycin, linezolid, cefotaxime, erythromycin, chloramphenicol, and clindamycin were 100%, 100%, 100%, 100%, 97,2%, 98,3%, and 94,7% respectively. In the study that performed Pittsburgh, it is reported that no isolate of GAS was determined to be resistant to clindamycin and there were no isolates that were resistant to erythromycin in the first 2 years of the study (13). In a comparative study of cefaclor and amoxicillin/clavulanate in pediatric patients with pharyngotonsillitis, all GAS isolates were found be susceptible to cefaclor and amoxicillin/clavulanate, and be both antibiotics had high and not significantly different eradication ratios at post-therapy (16). Although all isolates were found susceptible to ampicillin, ceftriaxone, and azithromycin, percentages of resistance of chloramphenicol, tetracycline, and ciprofloxacin were respectively found 19%, 14%, and 12% in a study (17). Eryilmaz et al. (18) reported that all GAS isolates were susceptible to penicillin although ratios of resistance for erythromycin, clindamycin, tetracycline, chloramphenicol were 3,6%, 2,7%, 7,3%, and 0,9% respectively. In another study, it was reported that all GAS isolates susceptible to erythromycin and penicillin (19). They reported that all isolates were susceptible to penisilin G, clindamycin, chloramphenicol, cefepime, and vankomycin and an isolate was resistance to erythromycin and another isolate was resistance to ofloxacin (15). In the several study observed that antimicrobial susceptibility ratios were different. Therefore, it is useful to use antimicrobial susceptibility testing for the treatment of GAS pharyngitis. Penicillin is a drug of choice for treatment of GAS pharyngitis and options include cephalosporins, erythromycin, clindamycin, chloramphenicol in penicillin-allergic patients (1, 4, 5, 8). The effective treatment period was 10 days in eliminating the carrier state (1, 4, 5, 8). A single intramuscular injection of benzathine benzylpenicillin can

be alternative therapy if it is anticipated that the patient will not adhere to a treatment regimen of oral antibiotics (1,4,5,8). Five days Azithromycin therapy also can be chosen as an alternative (1,5). Consequently, resistance to penicillin was not observed in our study and also in the world, penicillin may be safely chosen to treatment of these infections for non-allergic patients to penicillin. It is considered that culture method and antibiotic susceptibility testing may be more useful to for the diagnosis and treatment of these patients.

REFERENCES

1. American Academy of Pediatrics (AAP) (2012). Red Book: 2012 Report of the Committee on Infectious Diseases. Pickering LK, ed. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics.
2. Van Howe RS, Kusnier LP. Diagnosis and management of pharyngitis in a pediatric population based on cost-effectiveness and projected health outcomes. *Pediatrics* 2006; 117: 609-19.
3. Bisno AL, Gerber MA, Gwaltney JM, Kaplan EL, Schwartz RH. Practice guidelines for the diagnosis and management of group A streptococcal pharyngitis. *Clin Infect Dis* 2002;35:113-25.
4. Institute for Clinical Systems Improvement (ICSI). Health Care Guideline: Diagnosis and Treatment of Respiratory Illness in Children and Adults. First Edition. Bloomington, MN: Institute for Clinical Systems Improvement.
5. Shulman ST, Bisno AL, Clegg HW, Gerber MA, Kaplan EL, Lee G, Martin JM, Beneden CV (2012). Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update by the Infectious Diseases Society of America. *IDSA Guideline for GAS Pharyngitis CID* 2007; pp 1-17.
6. Brundage JF, Gunzenhauser JD, Longfield JN, et al. Epidemiology and control of acute respiratory disease with emphasis on group A beta-hemolytic Streptococcus: a decade of U.S. Army experience. *Pediatrics* 1996; 97: 964-70.
7. Clinical and Laboratory Standards Institute (CLSI). Performance standards for antimicrobial susceptibility testing; 18th informational supplement. *CLSI/NCCLS M100-S18*. Clinical and Laboratory Standards Institute, Wayne, Pennsylvania 2008.
8. WHO Expert Consultation on Rheumatic Fever and Rheumatic Heart Disease. Rheumatic fever and rheumatic heart disease: report of a WHO Expert Consultation, 29 October - 1 November 2001. Geneva 2004.
9. Nordet P, Lopez R, Dueñas A, Sarmiento L. Prevention and control of rheumatic fever and rheumatic heart disease: the Cuban experience (1986-1996-2002). *Cardiovasc J Africa* 2008;19: 135-40.
10. Santos O, Weckx LLM, Pignatari ACC, Pignatari SSN. Detection of group A beta-hemolytic Streptococcus employing three different detection methods: Culture, rapid antigen detecting test, and molecular assay. *BJID* 2003; 7: 297-300.
11. Omurzakova NA, Yamano Y, Saatova GM, Alybaeva MS, Nishioka K, Nakajima T. Prevalence of group A B-hemolytic Streptococcus among children with tonsillopharyngitis in Kyrgyzstan: The difficulty of diagnostics and therapy. *Open Rheumatol J* 2010;4: 39-46.
12. Morais VMS, Orsi AR, Maranhão FCA, Castro TMPPG, Castro KCB, Silva DMW. Prevalence of B-hemolytic Streptococcus in children with special health care needs. *Braz J Otorhinolaryngol* 2012; 78:110-5.
13. Martin JM, Green M, Barbadora KA, Wald ER. Group A Streptococci among school-aged children: Clinical characteristics and the carrier state. *Pediatrics* 2004;114:1212-9.
14. Danchin MH, Rogers S, Selvaraj G, et al. The burden of group A streptococcal pharyngitis in Melbourne families. *Indian J Med Res* 2004;119: 144-7.
15. Doğan M, Feyzioğlu B, Çimen Ö, et al. Investigation of antibiotic susceptibility for group A B-hemolytic Streptococci which isolated at tonsillar swab samples of 5-15 years old children. XXXIII. Turkish Microbiology Congress, Congress book; Bodrum, 2008; pp 652.
16. Haczyński J, Chmielik M, Bardadin J, et al. A comparative study of cefaclor vs amoxicillin/clavulanate in tonsillopharyngitis. *Med Sci Monit* 2003;9: 29-35.
17. Özakkafi F, Aksungar FB, Topkaya AE. Examination of antibiotic susceptibility of group A Beta-hemolytic Streptococci. *ANKEM J* 2007; 21: 10-3 (in Turkish).
18. Eryilmaz M, Akin A, Akan OA. The antibiotic susceptibilities of group A beta-hemolytic Streptococci isolated from throat cultures. *ANKEM J* 2006; 20:10-2(in Turkish).
19. İnan N, Erdoğan H, Berkiten R. Grouping and antibiotic resistance of beta-hemolytic Streptococci isolated from various clinical samples. *Klimik J* 2003;16: 118-120(in Turkish).