Med. J. Cairo Univ., Vol. 84, No. 1, June: 703-707, 2016
www.medicaljournalofcairouniversity.net

Study of Recurrent Pharyngitis Caused by Streptococcus Pyogenes and its Resistance to Different Antimicrobials

OSAMA A. EL-FEKY, M.D.*; AHMAD A. SOBEIH, M.D.*; YASSER M. ISMAIL, M.D.** and HEBA M. AZIZ, M.Sc.*

The Departments of Pediatrics and Clinical Pathology**, Faculty of Medicine, Benha University, Egypt*

Abstract

Objective: To examine and validate microbial diagnostic tests for etiological agent of tonsillo-pharyngitis in the study population and to examine antibiotic sensitivity/resistance of Streptococcus pyogenes to certain antimicrobial medications using the disc diffusion method.

Method: The study was conducted on 60 children who suffer from recurrent pharyngitis and 20 control healthy children, selected from paediatric outpatient clinic of Benha University, microbiologic laboratory investigations were performed and throat swab obtained.

Result: The results of our study showed that streptococcal pyogenes represents 18,7% of cases. They are sensitive to penicillin, linezolid and vancomycin, resistant to streptomycin and cephalexin.

Conclusion: Streptococcus pyogenes is a common bacterial cause of pharyngitis representing 18,7% of cases and need swab and culture for diagnosis to differentiate it from other causes. Streptococcus pyogenes is highly sensitive to linezolid (100%) vancomycin (100%) and penicillin (86,7%), and is highly resistant to streptomycin (100%) and cephalexin (100%).

Key Words: *Pharyngitis – Streptococcus pyogenes – Antimicrobials.*

Introduction

PHARYNGITIS is an inflammation of the mucous membranes and underlying structures of the throat. Acute pharyngitis is one of the most common illnesses for which children visit primary care physicians; about 90 percent of throat infections are caused by a virus. Although people who have the flu (influenza), cold sores (oral herpes simplex) or infectious mononucleosis ("mono") also commonly have a sore throat, these viral infections usually cause other associated symptoms in addition to throat pain **[1]**.

Correspondence to: Dr. Osama A. El-Feky, The Department of Pediatrics, Faculty of Medicine, Benha University, Egypt

Sore throat, fever with sudden onset (temperature greater than 38ºC [100.4ºF]), and exposure to streptococci within the preceding two weeks suggest GABHS infection. Cervical lymphadenopathy, pharyngeal or tonsillar inflammation and exudates are common signs. Palatal petechiae and scarlatiniform rash are highly specific but uncommon; a swollen uvula is sometimes noted. Cough, coryza, conjunctivitis and diarrhea are more common with viral pharyngitis **[2,3]**.

Antibiotics effectiveness, spectrum of activity, safety, dosing schedule, cost, and compliance issues all require consideration. Vancomycin, penicillin, penicillin congeners (ampicillin or amoxicillin), clindamycin, and certain cephalosporins and macrolides are effective against GABHS **[4]**.

Objective:

The aim of our study is to outline the recurrence of pharyngitis caused by streptococcus pyogenes and its resistance and sensitivity to different antimicrobials.

Patients and Methods

The present study was conducted on 60 children who suffered from recurrent pharyngitis and 20 control healthy children. They were selected from paediatric outpatient clinic of Banha University Hospitals. This case-control study was conducted from November 2014 to May 2015.

Inclusion criteria:

- Age: 5-15 years.
- Recurrent pharyngitis.
- Positive family history of pharyngitis.
- Children with tonsillectomy or not.

Exclusion criteria:

- Children younger than 5 years.
- Critically-ill child (sepsis or shock).
- Children with rheumatic fever.
- Children with abnormal laboratory results from the start, ex: Patients with leucocytosis, high liver or kidney functions and patients with chronic illness, ex: Chronic leukaemic patients.
- Patients with history of chronic suppurative complications from old recurrent pharyngitis.
- Patients with present illness like gastroenteritis, otitis media, urinary tract infection etc.

Written consent was taken from parents of all children. In this study patients were subjected to:

1- Complete history taking including drugs used for treatment.

2- Careful clinical examination including: Vital signs, systemic examination.

3- The following investigations:

- CBC for leucocytosis, lymphocytosis.
- CRP, ESR.
- ASOT was followed-up over seven weeks for evaluation of its subsidence and peak. Samples were collected weekly for all patients. Results were compared to the clinical situation.
- Throat swab was taken for positive ASOT cases to do culture and sensitivity. The results of culture will show the types of organisms and their percent, also their sensitivity and resistance to different antibiotics. Patients were classified into two groups.

Group A: Patients suspected of having pharyngitis by clinical examination and history taking. They were 60 patients who suffer from the clinical signs and symptoms of pharyngitis. They have undergone laboratory investigations and culture swab then follow-up.

Group B: Patients suspected to be free and healthy from any sign or symptom of pharyngitis. They were 20 patients classified as control group.

Statistical analysis:

The data were tabulated and manipulated using SPSS version 16.0 computer software. Numerical variables were presented as mean and Standard Deviation (SD), Any difference with p-value <0.05 was considered statistically significant.

Results

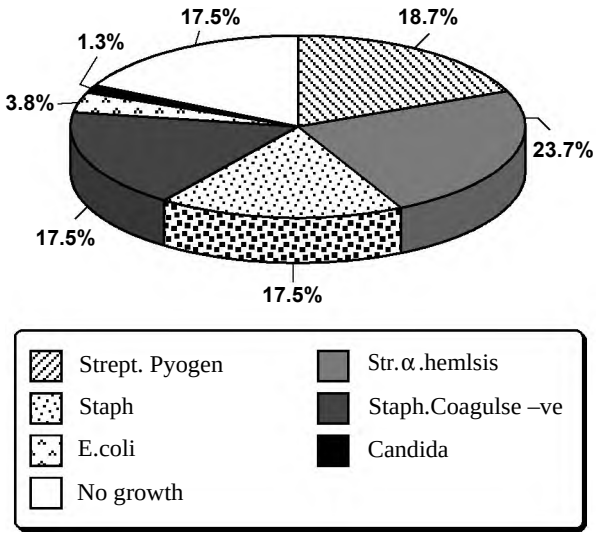

Fig. (1): Incidence of different organisms in the study group.

The antibiotic sensitivity and resistance are shown in Tables (1,2).

Percent of sensitivity and resistance of antibiotics to streptococcus pyogenes is shown in Table (3).

Table (1): Resistance of organisms to different antibiotics.

	Strept. pyogenes	Strept. a hemolysis	Staph. aureus	Staph. coagulase	E.coli	Candida
Penicilin	13.37%	31.60%	50.00%	14.00%	0.00%	0.00%
Oxacillin	16.6%	57.89%	50.00%	7.15%	0.00%	0.00%
Ampicillin sulbctam	66.5%	36.84%	50%	7.15%	100.00%	0.00%
Gentamycin	60.00%	47.31%	71.4%	50.0%	0.00%	0.00%
Azithromycin	46.70%	15.76%	92%	85.1%	0.00%	0.00%
Vancomycin	0.00%	36.80%	7.10%	0.00%	0.00%	0.00%
Streptomycin	100%	100%	14.26%	28.571%	33.30%	0.00%
Cefotaxime	91.6%	78.94%	42.85%	7%	33.30%	0.00%
Ciprofloxacin	75%	10.52%	28.57%	64.33%	0.00%	0.00%
Ampicillin	93.30%	89.47%	94.5%	52.4%	0.00%	0.00%
Trimethoprim	84.6%	84.21%	76.5%	71.5%	33.30%	0.00%
Teicoplannin	39.1%	89.47%	50%	0.00%	0.00%	0.00%
Linezolid	0.00%	0.00%	7.10%	7.14%	0.00%	0.00%
Cephalexin	100%	10.5%	85.7%	78.57%	0.00%	0.00%
Cephradine	59.9%	100%	92.82%	85.7%	0.00%	0.00%

Table (2): Sensitivity to different antibiotics.

	Strept. pyogenes	Str. a hemlysis	Staph. aureus	Staph. coagulase –ve	E.coli	Candida
Penicilin	86.70%	68.40%	50%	85.70%	0.00%	0.00%
Oxacillin	83.3%	42.1%	50.00%	92.85%	0.00%	0.00%
Ampicillin sulbctam	33.5%	63.15%	50%	92.85%	0.00%	0.00%
Gentamycin	40.00%	52.6%	28.5%	50%	100.00%	0.00%
Azithromycin	53.30%	84.2%	8%	14.28%	0.00%	0.00%
Vancomycin	100.00%	63.20%	92.90%	100%	0.00%	0.00%
Streptomycine	0.00%	0.00%	85.71%	71.42%	66.70%	0.00%
Cefotaxime	8.4%	21%	57.14%	92.85%	0.00%	0.00%
Ciprofloxacine	25%	89.47%	71.42	35.71	0.00%	0.00%
Ampiclline	6.70%	10.52%	7.14%	42.85%	0.00%	0.00%
Trimethoprim	15.4%	15.88%	21.42%	28.5%	66.70%	0.00%
Teicoplannin	59.9%	10.52%	50%	100%	0.00%	0.00%
Linezolid	100.00%	100.00%	92.85%	92.85%	0.00%	0.00%
Cephalexin	0.00%	89.47%	14.2%	21.4%	0.00%	0.00%
Cephradine	39.1%	0.00%	7.14%	14.28%	0.00%	0.00%

Table (3): Percent of sensitivity and resistance of antibiotic to streptococcus pyogenes.

	S	*r*
Penicilin	86.70%	13.30%
Oxacillin	83.4%	16.6%
Ampicillin sulbactam	33.5%	66.5%
Gentamycin	40.00%	60.00%
Azithromycin	53.30%	46.70%
Vancomycin	100.00%	0%
Streptomycin	0%	100%
Cefotaxime	8.4%	91.6%
Ciprofloxacin	25.00%	75.00%
Ampicllin	6.70%	93.30%
Trimethoprim	15.4%	84.6%
Teicoplannin	59.9%	39.1%
Linezolid	100%	0%
Cephalexin	0%	100%
Cephradine	39.1%	59.9%

Discussion

The current study deals with the recurrent pharyngitis due to streptococcus pyogenes and its response to different antimicrobials. This infection is not new, it was first described by Rebecca Lancefield in the early 20th century, who distinguished NAG carbohydrate antigen of GABHS, N-acetyt-Glucosamine **[5]**.

The results of our current study on 60 patients showed that the incidence of organisms causing pharyngitis were 18.7% for streptocccus pyogens, 23.7% strept alpha haemolysis, 17.5% for staph. Aureus, 17.5% for staph coagulase negative, 3.8% for E.Coli, 1.2% for candida and 17.5% no growth.

Our study showed that clinical manifestations in form of sore throat, fever, red pharynx, enlarged tonsils with yellow or blood tinged exudates are more prominent in cases of GABHS. Sometimes anterior cervical lymph nodes are enlarged. Other associated symptoms as anorexia and abdominal discomfort may be present. Cough, rhinorrhea and sneezing are common in viral illness.

The evaluation of blood markers in our study showed that ASOT was positive in GABHS in 100% of cases. While it was negative in control group in 100%. So, we followed-up ASOT in cases which showed that ASOT rises few days to one week after infection and reaches maximum at 5-7 weeks and declines at 8-9 weeks.

This agrees with Lieberman et al., (2009) who showed that the laboratory results of GABHS are higher and more significant, especially ASOT, where it starts to rise in the first week, then reaches maximum at 3-6 weeks and starts to decline in 40% of patients in 6-8 weeks. The cause of persistent ASOT in 60% of patients is not understood **[6]**.

A culture of single throat swab has sensitivity of 85-90%. It should be done in acute phase of infection and the patient is free from Antibiotics. Swab should be obtained from the surface of both tonsils and posterior pharyngeal walls and plotted on blood agar at 35ºC for 24hs.

Other studies **[7]** show that the most common and important bacterial cause of acute pharyngitis in children is streptococcus pyogenes which is responsible for 15%-30% of cases. When suspected, bacterial pharyngitis should be confirmed with routine diagnostic tests and treated with various antibiotics. Swabbing the throat and culture should be performed as clinical features alone cannot reliably distinguish GAS pharyngitis from viral pharyngitis. The exceptions to these is when patients present overt clinical features of viral infection including rhinorrhea, cough, oral ulcers, and/or hoarseness.

Results of our study showed that streptococcus pyogenes was highly sensitive to penicillin (86,7%), vancomycin (100%) and linezolid (100%). While staphylococcus aureus was highly sensitive to vancomycin (92.9%) and linezolid (92.85%). Staphylococcus coagulase –ve was sensitive to vancomycin (100%) and teicoplanin (100%). E.coli was sensitive to gentamicin (100%) then and trimethoprim (66.2%).

Our study showed also the resistance to some antimicrobials; where streptococcus pyogenes was highly resistant to cephalexin (100%) and streptomycin (100%). Strept. alpha hemolysis was resistant to streptomycin (100%) and cephradine (100%). Staph. aureus was resistant to azithromycin (92%), cephradine (92.82%) and ampicillin (94.5%). E. coli was resistant to ampicillin sulbactam (100%).

Other study for prevalence of GABHS and its sensitivity to different antibiotics **[8]**; showed that GABHS was sensitive to vancomycin in 89.5%, erythromycin in 59.6%. Surprisingly, all cases of GABHS which were cultured, were resistant to penicillin, the most reliable and commonly used antibiotic. After penicillin the highest proportion of resistance was for co-trimoxazole in 91.2%, amoxicillin in 87,7% and none of isolated streptococci was sensitive to ampicillin. Their study suggested that the inappropriate use of these antibiotics increased the chronic carrier state of GABHS in their community.

In another study, **[9]** streptococcus pyogenes was isolated in 21/123 (17.1%) patients, it was found that 21 isolates (100%) were sensitive to penicillin out of total 21. And was found that 13 isolates (61.9%) were sensitive to erythromycin out of total 21. Also it was observed that 15 isolates (71.4%) out of total 21 isolates were sensitive to azithromycin and 7 isolates (33.3%) out of total 21 isolates were sensitive to tetracycline.

Conclusion:

Streptoccocus pyogenes causes severe pharyngitis and tonsillitis and requires culture for isolation by pharyngeal swabbing. It is highly sensitive to Linezolid (100%), vancomycin (100%) and penicillin (86.7%). While it is highly resistant to streptomycin (100%), cephalexin (100%) and ampicillin (93.3%).

References

1- CENTOR R.M., WITHERSPOON J.M., DALTON H.P., BRODY C.E. and LINK K.: The diagnosis of strep throat in adults in the emergency room. Med. Decis. Making, 1: 239-46, 2013.

2- VAN HOWE R.S. and KUSNIER L.P. II.: Diagnosis and management of pharyngitis in a pediatric population based on cost-effectiveness and projected health outcomes. Pediatrics, 117 (3): 609-19, 2006.

3- KAPLAN E.L., TOP F.H. Jr., DUDDING B.A. and WANNAMAKER L.W.: Diagnosis of streptococcal pharyngitis: Differentiation of active infection from the carrier state in the symptomatic child. J. Infect. Dis., 123: 490-501, 2012.

4- BREESE B.B., DISNEY F.A., and BASS J.W.: The accuracy of diagnosis of beta-hemolytic streptococcal infections on clinical grounds. J. Pediatrics, 44: 670-3, 2007.

5- TURNER J.C., HAYDEN F.G., LOBO M.C., et al.: Epidemiologic evidence for Lancefield Group C beta hemolytic streptococci as a cause of exudative pharyngitis in college students. J. Clin. Microbio., 239-46, 2012.

6- LIEBERMAN D., SHVARTZMAN P. and KORSONSKY I.: Aetiology of respiratory tract infections: Clinical assessment versus serological tests. Br. J. Gen. Pract., 51 (437): 998-1000, 2009.

7- MERSCH J.: Strep throat (Symptoms, Causes, Diagnosis, and Treatment). MedicineNet.com. New York: Web MD LLC. www. On health.com/strep throat/article.htm, 2012.

8- FATEMEH N., MOHAMMED A. et al.: Prevalence of Beta-hemolytic Streptococcus Carrier State and its Sensitivity to Different Antibiotics among Guidance-School Children in Kerman-Iran. American Journal of Infectious Diseases, 1 (2): 128-31. 2005.

9- SANJEEB, SHARMA S.H., PRAVEEN, et al.: IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN, 2279-0861. Volume 13, Issue 11 Ver. Vi, pp 50-5, 2014.

الملخص العربى

التهاب الحلق هو التهاب فى الأغشية المخاطية والطبقات الأساسية من الحلق. التهاب الحلق الحاد هو واحد من الأمراض الأكثر شيوعا لدى الأطفال. العديد من الفيروسيات والبكتيريا قادرة على احداث التهاب الحلق، إما ككيان منفصل أو كجزء من التهاب آخر مصاحب. المجموعة A–بيتا الحالة للدم العقدية هى الاكثر شيوعا فى الحالات البكتيرية المسببة للتهاب الحلق الحاد فى الأطفال (الاستربتوكوكس بيوجين)، أما الفيروسات عادة ما تكون حميدة.

هناك استراتيجيات لتشخيص وعلاج التهاب الحلق فى الأطفال بمضادات الميكروبات، أما التهاب الحلق الفيروسى فلن يستفيدوا من العلاج بالمضاد للميكروبات، والأطفال الذين يعانون من التهاب الحلق العقديات مجموعة A–بيتا الحالة للدم، مضادات الميكروبات سيكون مفيدا لهم خصوصا اذا بدأ العلاج مبكرا. فتحديد نوع الأصابة أمر حاسم فى محاولة للحد من الاستخدام غير الضرورى للمضادات الحيوية لدى الأطفال.

يتم العلاج بمضادات للميكروبات لمن لديهم أعراض التهاب الحلق بعد التأكد من وجود ميكروب فى الحلق عن طريق مسحة الحلق أو RADT. فى الحالات التى بها نسبة شك عالية عن طريق الكشف الأكلينيكى يمكن البدء فى العلاج المضادة للميكروبات حتى انتظار التأكيد المختبرى، شريطة أن يكون هذا العلاج يمكن ايقافه إذا كان تشخيص مجموعة العقديات بيتا الحالة للدم فى المختبر غير صحيح. أما الشروع فى وقت مبكر بالعلاج المضاد للمرضى الذين يعانون من مجموعة (GABHS) الحلق العقديات مجموعة A–بيتا الحالة للدم عادة ما يعانون من التهاب فى الحلق (بشكل عام ومفاجئ)، ألم شديد فى البلع، والحمى. والصداع، والغثيان، والتقيؤ، وآلام فى البطن قد تكون موجودة أيضا، خاصة عند الأطفال. بالفحص من الممكن وجود احمرار بغشاء الحلق، مع أو بدون الإفرازات، والغدد اللمفاوية العنقية الأمامية متضخمة.

هناك الفحوصات التى يمكن تكون ملحوظه فى التهابات العقديات. كمسحة الحلق على لوحة أجار الدم تبقى معيارا لتوثيق وجود مجموعة A العقديات فى الجهاز التنفسى العلوى ولتأكيد التشخيص لالتهاب الحلق الحاد، إذا تمت بشكل صحيح، تكون مسحة الحلق لديها حساسية من ٩٠٪–٩٥٪ للكشف عن وجود مجموعة A العقديات فى البلعوم.

عدة متغيرات تؤثر على دقة النتائج لمسحة الحلق، على سبيل المثال، الطريقة التى يتم الحصول عليها للمسحة له تأثير هام على النتائج. فينبغى الحصول على عينات مسحة الحلق من على سطح البلعوم على حد سواء اللوزتين والجدار الخلفى البلعوم. المناطق الأخرى من مثل الفم واللثتين ليست مواقع مقبولة، ويجب أن لايتم لمس هذه المواقع أثناء المسحة وأن يتم أخذ العينات من المناطق المناسبة.

لقد وجد ان نسب الميكروبات فى الدراسة كالتالى:

المجموعه A بيتا الحالة للدم العقدية ١٨،٧٪، وال strept alph انحلال الدم ٢٣،٧٪، والعنقوديات الزهبية (staph.aureus) ١٧،٥٪، العنقوديات المخثره (staph.coagulase –ve) ١٧،٥٪، ايكولاى ٣،٨٪، الكانديدا، ٣،٨٪ وبدون نمو للميكروبات ١٧،٥٪.

وقد اظهرت المزرعة لهذه الميكروبات حساسيتها ومقاومتها للمضادات الحيوية المختلفة.

وقد وجد ان: المجموعة A بيتا الحالة للدم حساسة جدا للفانكوميسين بنسبة ١٠٠٪ واللينزوليد بنسبة ١٠٠٪ وايضا للبنسللين بنسبة ٨٦،٧٪. وال strept alpha انحلال الدم حساسة جدا للينزوليد ١٠٠٪، والسيبروفلوكساسين ٨٩،٤٧٪ وايضا للكيفالكسين بنسبه ٨٩،٤٧٪. ووجد ايضا ان ميكروب العنقوديات الزهبية حساسة جدا للفانكوميسين بنسبة ٩٢،٩٪ واللينزوليد بنسبة ٩٢،٨٥٪. وميكروب العنقوديات المخثره حساس للفانكوميسين ١٠٠٪ وللتيكوبلانين ١٠٠٪. والايكولاى حساسه للجنتاميسين ١٠٠٪. ووجد ايضا ان المجموعة A بيتا الحالة للدم مقاوم للستربتوميسين بنسبة ١٠٠٪ وللكفالكسين بنسبة ١٠٠٪. وميكروب ال strept alpha انحلال الدم مقاوم للستربتوميسين ١٠٠٪ والسيفرادين بنسبة ١٠٠٪. وميكروب العنقوديات الزهبية مقاوم للامبيسللين ٩٤،٥٪ وللزيثروميسين بنسبة ٩٢٪ وللسيفرادين بنسبة ٩٢،٨٢٪. وميكروب العنقوديات المخثره مقاوم للسيفرادين بنسبة ٨٥،٧٪ وللزيثروميسين بنسبة ٨٥،١٪. والايكولاى مقاوم للامبيسللين سالبيكتام بنسبة ١٠٠٪.