Demographic and socioeconomic determinants of treatment effectiveness of streptococcal tonsillopharyngitis in Albanian children

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Abstract

Aim: The aim of this study was to assess the treatment effectiveness of Group A Beta hemolytic streptococcus (GABHS) tonsillopharyngitis in Vlora, which is the main district in south Albania.
Methods: A cross-sectional study was conducted in Vlora district during December 2013 –February 2014 including 63 children diagnosed with GABHS tonsillopharyngitis. All children were treated with antibiotics for ten days. Afterwards, all children were reexamined for the presence of GABHS and classified as "GABHS negative" versus "GABHS positive" (carriers). In both rounds, identification of GABHS was done through isolation of the microorganism by throat cultures. Binary logistic regression was used to assess the association of positive cultures after antibiotic treatment with demographic and socioeconomic characteristics of the children and their parents.
Results: Of 63 children treated with antibiotics, 46 (73%) resulted negative, whereas the remaining 17 (27%) were positive (alias, GABHS carriers). There was evidence of positive association between GABHS carriers and male gender (OR=3.9, 95%CI=1.1-13.7), fathers' lower educational level (OR=4.6, 95%CI=1.4-15.3), mothers' unemployment (OR=6.8, 95%CI=2.0-23.4) and fathers' unemployment (OR=5.0, 95%CI=1.5-16.7).
Conclusion: Our study provides novel evidence about the treatment effectiveness of GABHS tonsillopharyngitis among children aged 5-15 years in the main region of south Albania.

Keywords: carrier, GABHS, streptococcus, treatment effectiveness, Vlora.

Introduction

Pharyngitis is one of the most common infections encountered in primary care clinics. Group A beta hemolytic streptococcus (GABHS) is the most common cause of non viral pharyngits (1). GABHS pharyngitis is most frequent in children of 5 to 15 years of age, during late winter and early spring. During this period, approximately 15 to 25 percent of all cases of pharyngitis will be the result of streptococcal infection (2). GABHS pharyngitis typically has an acute onset, with dysphagia, headache, fever, and objectively is characterized by tonsillopharyngeal erythema, purulent exudate, and enlarged anterior cervical glands. Unfortunately only 20-30% of the patients present with the classical symptoms of the disease, so clinical judgment is not enough for the diagnose (2). Currently throat cultures or other faster tests for GABHS identification are recommended, because they lead to a more rightful use of antibiotics (3). Fast tests are based on identification of the group A carbohydrate antigen, and have high specificity, but not as good sensitivity, so throat culture is still the gold standard for GABHS isolation and identification. Streptococcal pharyngitis is a self-limited disease, so even without treatment, fever and symptoms resolve within 3 to 4 days, but still treatment is important in preventing the development of acute rheumatic fever, offer more rapid resolution of symptoms, and decrease transmission of GABHS to other children (4,5). A clinical response usually is achieved within 24 to 48 hours after initiation of therapy, a persistence of symptoms beyond this period suggests that a suppurative complication has developed. Complications that can arise after a GABHS pharyngitis include both suppurative, such as retropharyngeal abscess, and non-suppurative, such as acute rheumatic fever (ARF) and poststreptococcal glomerulonephritis. Penicillin is still the drug of choice for treating GABHS infections. There are no cases of resistance of GABHS to penicillin, while other streptococci have developed resistance to multiple antibiotics (6,7). Erythromycin is the best alternative for patients allergic to penicillin (Table 1) (5).

Table 1. Recommended therapy for the treatment of GABHS pharyngitis (5)

Antimicrobial agent	Dose
Penicillin VK	<27kg: 250mg 2-3 times per day, 10 days >27kg: 500mg 2-3 times per day, 10 days
Penicillin G Benzathine	<27kg: Single dose of 600,000 units IM >27kg: Single dose of 1,2 million units IM
Amoxicillin	<27kg: 250mg 2-3 times per day, 10 days >27kg: 500mg 2-3 times per day, 10 days
Erythromycin estolate	20-40mg/kg/day for 10 days
Erythromicin ethylsuccinate	40mg/kg/day in 2-4 doses for 10 days
Cephalexin	30mg/kg/day in 4 doses for 10 days
Cefadroxil	30mg/kg/day in 4 doses for 10 days
Cefaclor	30mg/kg/day in 4 doses for 10 days
Cefuroxim axetil	15mg/kg/day in 2 doses for 10 days
Cefixime	8mg/kg once a day for 10 days
Cefdinir	14mg/kg once a day for 5 days

We have chosen Cefaclor suspension or tablets, at the recommended doses, for the treatment of GABHS pharyngitis. Even though cephalosporins are more expensive, and have greater side effects, there are a lot of studies, which show that they are more effective than penicillin especially at eradicating GABHS (8,9).

Methods

A cross-sectional study conducted in Vlora during December 2013 – February 2014 included 312 children aged 5-15 years was included (56% girls, 44% boys; overall response rate: 89%). All children were examined for the presence of GABHS tonsillopharyngitis. The prevalence of GABHS in this population was 20.2% (N=63). These 63 children who were diagnosed with GABHS tonsillopharyngitis were subsequently treated with antibiotics for a period of ten days. Afterwards, they were reexamined for the presence of GABHS and classified as "GABHS negative" versus "GABHS positive" (carriers).

In both rounds, identification of GABHS was done through isolation of the microorganism by throat cultures, but the second culture was done 10 days after the end of therapy.

Demographic data of the children (age and sex) and socioeconomic information about their parents (employment status and educational attainment) were collected for all 63 children treated with antibiotics.

Permission for recruitment of the children was obtained by their respective parents who provided information on socioeconomic characteristics.

Binary logistic regression was used to assess the association of GABHS status at the end of the antibiotic treatment (positive versus negative) with demographic and socioeconomic characteristics (independent variables). Crude (unadjusted) odds ratios (ORs) and their respective 95% confidence intervals (95%CIs) were calculated. A p-value of ≤ 0.05 was considered as statistically significant in all circumstances. Statistical package for Social Sciences (SPSS, version 15.0) was used for all the statistical analyses.

Results

Table 2 presents the distribution of background characteristics in a sample of Albanian children according to their streptococcal infectious status after antibiotic treatment. Of 63 children treated with antibiotics, 46 (73%) resulted negative, whereas the remaining 17 (27%) were positive (alias, GABHS carriers). The prevalence of carriers after the

Table 2. Distribution of background characteristics in a sample of Albanian children according to their streptococcal infectious status after antibiotic treatment

Variable	Negative (N=46)	Positive/Carriers (N=17)	Total (N=63)
Sex:			
Boys	21 (61.8)*	13 (38.2)	34 (100.0)
Girls	25 (86.2)	4 (13.8)	29 (100.0)
Total	*46 (73.0)*	*17 (27.0)*	*63 (100.0)*
Age:			
5-7 years	7 (63.6)	4 (36.4)	11 (100.0)
8-15 years	39 (75.0)	13 (25.0)	52 (100.0)
Mothers' education:			
Low	26 (66.7)	13 (33.3)	39 (100.0)
Middle/high	20 (83.3)	4 (16.7)	24 (100.0)
Fathers' education:			
Low	9 (50)	9 (50.0)	18 (100.0)
Middle/high	37 (82.2)	8 (17.8)	45 (100.0)
Mothers' employment status:			
Unemployed	12 (50.0)	12 (50.0)	24 (100.0)
Employed/retired	34 (87.2)	5 (12.8)	39 (100.0)
Fathers' employment status:			
Unemployed	15 (55.6)	12 (44.4)	27 (100.0)
Employed/retired	31 (86.1)	5 (13.9)	36 (100.0)

* Absolute numbers and their respective *row* percentages (in parentheses).

treatment with antibiotics was higher in boys than in girls (38.2% vs. 13.8%, respectively) and in younger children compared with their older counterparts (36.4% vs. 25.0%, respectively). Children with low educated mothers had a higher prevalence of GABHS carriers than children whose mothers had a middle or high educational level (33.3% vs. 16.7%, respectively). Similarly, children with low educated fathers had a higher prevalence of GABHS carriers than children whose fathers had a middle or high educational level (50.0% vs. 17.8%, respectively). Furthermore, the prevalence of GABHS carriers was higher among children whose mothers or fathers were unemployed (50.0 vs. 12.8, respectively, and 44.4% vs. 13.9%, respectively) (Table 2).

Table 3 presents the association of association of streptococcal infection status after antibiotic treatment with demographic factors of the children and socioeconomic characteristics of their parents. There was evidence of positive association between GABHS carriers and male gender (OR=3.87, 95%CI=1.09-13.67). Conversely, there was no significant association with age-group (P=0.444). There was a non-significant relationship with mothers' low education (P=0.155), but a strong and statistically significant association with fathers' lower educational level (OR=4.63, 95%CI=1.39-15.34). Presence of GABHS after treatment with antibiotics was positively related to both mothers' unemployment (OR=6.80, 95%CI=1.98-23.35) and fathers' unemployment (OR=4.96, 95%CI=1.48-16.67) (Table 3).

Table 3. Association of streptococcal infection status after antibiotic treatment with demographic factors of the children and socioeconomic characteristics of their parents

Variable	OR*	95%CI*	P*
Children's sex:			
Girls	1.00	reference	0.036
Boys	3.87	1.09-13.67	
Children's age:			
5-7 years	1.00	reference	0.444
8-15 years	0.58	0.15-2.32	
Mothers' education:			
Middle/high	1.00	reference	0.155
Low	2.50	0.71-8.84	
Fathers' education:			
Middle/high	1.00	reference	0.012
Low	4.63	1.39-15.34	
Mothers' employment status:			
Employed/retired	1.00	reference	0.002
Unemployed	6.80	1.98-23.35	
Fathers' employment status:			
Employed/retired	1.00	reference	0.012
Unemployed	4.96	1.48-16.67	

* Crude (unadjusted) odds ratios (OR: positive vs. negative streptococcal infection), 95% confidence intervals (95%CIs) and p-values from binary logistic regression.

Discussion

Despite the use of an expensive antibiotic, 27% of the children had positive cultures at the end of the treatment. There are several explanations for these failures (5):

- "true" treatment failure, which occurs when the specific emm type of GABHS cannot be eradicated.
- failure to eradicate GABHS carrier state in a child with an acute viral illness.
- the acquisition of a different emm type of GABHS immediately following the first episode of infection.
- eradication of the organism followed by the development of a second episode of streptococcal pharyngitis with the same emm type.

According to our study, parents' educational level can also be important, probably because of the correct way of administration of treatment, in dose and duration. Streptococcal carriers usually do not require antimicrobial therapy, but GABHS eradication is recommended when there is a family history of rheumatic fever, when there is a ping-pong spread in a family, when outbreaks of ARF or acute glomerulonephritis, when outbreaks of GABHS pharyngitis in a closed community (10,11). At this point from our experience, still tonsillectomy is the best way for eradicating GABHS.

There is a lot of antibiotic overuse in our country, probably due to the lack of official therapy protocols for various diagnoses. Even though GABHS identification tests are readily available in Albania, rarely physicians prescribe them before treatment. Further research should aim for the best effective treatment, lowering overall cost and preventing antimicrobial resistance.

Conflicts of interest: None declared.

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