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Short Communication

The Rate of Asymptomatic Throat Carriage of Group A *Streptococcus* in School Children and Associated ASO Titers in Duzce, Turkey

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SUMMARY: A prospective study was conducted to investigate the rate of group A streptococci (GAS) carriers and associated anti-streptolysin O (ASO) titers in serum samples in asymptomatic school children in spring in Duzce, Turkey. Pharyngeal swabs were obtained to detect the presence of GAS and blood samples were collected to determine elevated ASO titers in serum. A total of 351 asymptomatic primary school children were included in the study, and 91 (25.9%) of these were found to be GAS carriers. Of the 91 carrier students, ASO titers were elevated (≥200 IU/ml) in 34 students (37%). Of the 260 non-carrier children, ASO titers were found as elevated (≥200 IU/ml) only in 27 (10.3%) students. The difference between the ASO-positivity rate of the GAS carrier group (34 in 91 students) and that of the non-carrier group (27 in 260 students) was found to be statistically significant ($P < 0.05$). The finding of a significant relationship between ASO positivity and GAS carriage indicated that ASO measurement might be used together with thorat culture to identify GAS carriers.

Acute pharyngitis is a common illness in children and adults and its etiology includes a wide variety of microbial agents. Group A streptococci (GAS) are the most frequently isolated pathogens in acute pharyngotonsillitis cases in school-aged children. In children, approximately 20% of pharyngitis cases are caused by GAS (1). Streptococcal sore throat is one of the most common bacterial infections of childhood. GAS are responsible for the great majority of such infections and frequently colonize in the throat of an asymptomatic person. Pharyngeal carriage rates among normal school children vary with the geographic location and season of the year. Among children, asymptomatic carriage rates of 15 - 20% have been noted in several studies (2). GAS consists of a single species, *Streptococcus pyogenes* (2). This microorganism causes complete hemolysis of red blood cells on sheep blood agar. The pathogenesis of GAS is mediated by a variety of factors. One of them is streptolysin O toxin, which damages cell membranes and accounts for the hemolysis demonstrated on sheep blood agar. In addition to pharyngitis, GAS are also one of the etiologic agents of impetigo, cellulitis, and scarlet fever. Further, GAS can cause serious postinfection syndromes such as acute rheumatic fever and post-streptococcal glomerulonephritis. GAS infection is ordinarily spread by direct person-to-person contact, most likely via drops of saliva or nasal secrections. Respiratory droplets are the usual mechanism of spread because this organism primarily localizes in the throat (1,2).

In the present study, we investigated the rate of GAS carriage in school children in Duzce, Turkey in spring. A total of 351 children (148 girls [42.2%] and 203 boys [57.8%]) were included in the study. The ages of the children ranged between 11 and 13 years (mean: 11.9 ± 0.7 years). Prospective collection of clinical and microbiologic data were obtained from school children who were asymptomatic for throat infection. The children were included only if their father or other adult with legal custody of the children had agreed to give written informed consent. The children were questioned in regard to the presence of clinical symptoms such as sore throat, fever, chills and malaise, and examined for the presence of signs such as erythema and swelling of the pharyngeal mucosa. Those who had any such symptoms or signs were excluded. Only asymptomatic children were included in the study.

Pharyngeal swabs were obtained to detect the presence of GAS. Culture samples were taken from the pharynx by swabbing, inoculated onto sheep's blood agar plates, and incubated for 48 h in an atmosphere of 5 - 10% CO_2 at 35°C. Isolates with positive colony morphology and β hemolysis were examined for bacitracin sensitivity and trimethoprim-sulfamethoxazole resistance to diagnose GAS. The blood samples were taken from all children. Anti-streptolysin O (ASO) titers were analyzed by a luminometer (Dade Behring, Deerfield, Ill., USA) on the same day. All test results were recorded. The ASO titers that were higher than 200 IU/ml were accepted as positive. Statistical analysis was performed using SPSS 10.0 for Windows 98. Numerical data were analyzed with Student's *t* test. A chi-square test was applied for the categorical data. A *P* value equal to or less than 0.05 was considered statistically significant.

GAS was isolated from 91 (25.9%) of the total of 351 throat cultures from the asymptomatic primary school children (Table 1), and normal bacterial flora was isolated from the other 260 cultures. Thus the rate of GAS carriage among the 351 children was 25.9 %. Among the 91 carrier students, ASO titers were found to be elevated (≥200 IU/ml) in 34 students

Table 1. The rate of GAS carrier and associated serum ASO positivity

Culture results	*n* (%)	ASO positivity ≥200 IU/ml *n* (%)
GAS carrier	91 (25.9)	34 (37)
Non-carrier	260 (73.9)	27 (10.3)

($P < 0.05$)

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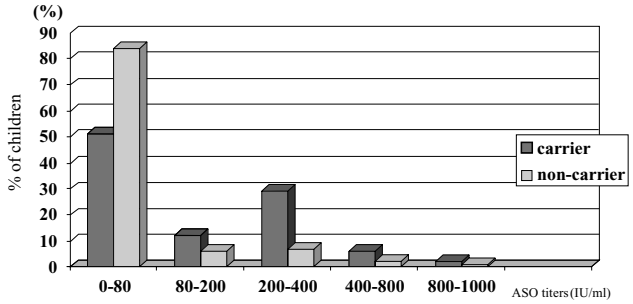

Fig. 1. The distribution of ASO values in both of groups. In 90% of non-carrier group ASO value was 0 - 200 IU/ml; in 10% of non-carrier group it was >200 IU/ml. In 63% of carrier group ASO value was 0 - 200 IU/ml; in 37% of carrier group it was >200 IU/ml.

(37%). Among the 260 non-carrier children, ASO titers were found to be elevated (≥200 IU/ml) in only 27 (10.3%) students (Table 1 and Fig. 1). The sensitivity and specificity of ASO values for predicting GAS carriage were found to be 37 and 89%, respectively.

GAS are the most frequently isolated pathogen in cases of acute pharyngotonsillitis in school-aged children. GAS throat carriage is important, as the infection is acquired through contact with another individual carrying the bacterium (1). Nussinovitch et al. (3) reported that positive throat cultures of GAS in 61 of 415 patients (14.7%) and their study group consisted of symptomatic children aged 3 months to 5 years. Other studies on the prevalence of GAS throat carriage in healthy children reported rates of 28.8 (4), 6 (5), 22 (6), and 10.9% (7). In similar studies conducted in Turkey, the rate of GAS carriage in asymptomatic school children varied from 2 to 46% (8). Altindis et al. (9) reported that the rate of GAS carriage in primary school students in Afyon, Turkey was 17%. They compared the rate of GAS carriage of children studying at two different schools. They found that the rate of carriage in healthy children in an impoverished region was 6%, and that the rate in more affluent, suburban students was 28%. Metintas et al. (8) examined GAS carriage in asymptomatic primary school children and reported a prevalence of 13%. As they pointed out, GAS carriage is highly important, since it leads to post-streptococcal infection, and children with post-streptococcal infection represent a source of streptococcal infections.

In our study, the isolation rate of GAS was 25.9% in asymptomatic school children. This result is within the ranges reported from different centers in Turkey and other countries. Okuyama et al. (10) have examined the relationship of ASO to the carrier state of β hemolytic *Streptococcus* in throats of healthy school children. They reported elevated ASO responses in children who carried A, C, and G streptococci. Nussinovitch et al. (3) reported elevated ASO titers in 54.1% of children presenting with upper respiratory tract symptoms and positive throat cultures. In the present study, we investigated only GAS carriage in throat specimens. Detection of GAS carriers may help in diminishing streptococcal disease and its complications both in carriers and their contacts. In conclusion, the GAS carriage rate was found to be 25.9% in our study. The difference between the ASO-positivity rate of the GAS carrier group (34 of 91 students) and that of the non-carrier group (27 of 260 students) was found to be statistically significant ($P < 0.05$). The finding of a significant relationship between ASO positivity and the carriage of GAS indicated that ASO measurement might be used together with thorat culture to identify GAS carriers. The ASO values were determined to be between 0 - 80 IU/ml and 200 - 400 IU/ml in the non-carrier group and carrier group, respectively (Fig. 1). The sensitivity and specificity of ASO values for predicting GAS carriage were found to be 37 and 89%, respectively. It is concluded that GAS carriers can not be determined by their ASO values alone.

APPENDIX

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