

Rates and Risk Factors of *Staphylococcus aureus* Nasal Carriage in Elementary School Children

To the Editor

Staphylococcus aureus causes serious hospital and community-acquired infections all over the world (1). *S. aureus* colonize most frequently in the anterior nares of the nose of adults and children. The anterior nares of the nose are the primary reservoir of *S. aureus*, with approximately one-third of the general population colonized at any given time (2). Association between *S. aureus* nasal carriage and staphylococcal disease has been reported since 1931 (3). Risk factors for

S. aureus nasal carriage have been recently demonstrated, such as having a family member working in a hospital and having asthma (2, 4). The aim of this study was to determine the rates and risk factors of *S. aureus* nasal carriage in Turkish elementary school children. The study performed during the 10-months period from February to November 2007 in Ankara, the capital of Turkey. Seven elementary schools were randomly selected in this region. A total of about 4500 elementary school children aged between 7 and 12 years were enrolled. The 4097 nasal samples, taken with sterile cotton swabs, (CultureSwab Transport System; Difco, Detroit, Mich., USA) were obtained from children who agreed to the standard terms of informed consent. The nasal swabs were obtained from children and cultured onto 5% sheep blood agar plates (Oxoid, Hampshire, England) within 1-2 hours. Plates

Table 1. Comparison of demographic data of *Staphylococcus aureus* colonized and non-colonized children

Variable	<i>Staphylococcus aureus</i> (n=1009)	Non-colonized (n=3088)	χ^2 value	p value
Hospitalized within the past year	45 (4.4)	151 (4.8)	0.342	0.559
Hospitalization of a family member within the past year	114 (11.2)	359 (11.6)	0.109	0.742
History of antibiotic use within the past six months	565 (55.9)	1541 (49.9)	10.518	0.001
Chronic disease	88 (8.7)	239 (7.7)	0.921	0.337
Mother's job				
Does not work	799 (79.1)	2614 (84.6)		
Any job	176 (17.4)	423 (13.6)		
Employed at a hospital or clinic	34 (3.3)	51 (1.6)	9.286	0.002
Father's job				
Any job	971 (96.2)	3009 (97.4)	4.428	0.035
Employed at a hospital or clinic	38 (3.7)	79 (2.6)		
Mother's education				
Elementary school	553 (54.8)	1882 (60.9)	34.648	0.001
High school	313 (31.1)	962 (31.1)		
College	143 (14.1)	246 (7.9)		
Father's education				
Elementary school	446 (44.2)	1375 (44.5)	1.344	0.511
High school	339 (33.5)	1080 (34.9)		
College	224 (22.2)	633 (20.4)		
Family member with chronic disease	166 (16.4)	429 (13.8)	0.303	0.582
Smoker in Household				
No	290 (28.7)	1491 (48.2)	117.378	0.001
Yes	719 (71.2)	1597 (51.7)		
More than 3 Household				
≤3	128 (12.6)	774 (25.1)	69.872	0.001
>3	881 (87.3)	2315 (74.9)		
Sex				
Male	490 (48.5)	1361 (44.1)	5.996	0.014
Female	519 (51.4)	1727 (55.9)		

NOTE. Data are no. (%)

were incubated at 35°C aerobically for 16-18 h. *S. aureus* was identified by Gram stain, catalase and tube coagulase. *S. aureus* ATCC 29213 was used as a control strain. In this study, we evaluated nasal swab samples collected from 4097 children, including 1851 boys and 2246 girls. The median age of study participants was 8 years (range, 7-12 years). We found that 1009/4097 (24.6%) of children were colonized with *S. aureus*. Children colonized with *S. aureus* were not distinguishable from non-colonized in terms of hospitalization within 12 months, having chronic diseases, having a family member with chronic diseases, father's education. However, there was a statistically significant association between colonization rates and antibiotic administration history within the past six months, mother's education, family member employed at a hospital or clinic, smoker in households, more than three household members and sex (Table 1). *S. aureus* is one of the most important microorganisms causing hospital and community-acquired infection. It can cause serious infections including septicemia, pneumonia, endocarditis, and deep-seated abscess (5). The anterior nares of the nose is the site most frequently colonized with *S. aureus*. Other extra-nasal sites of the body include the skin, perineum, and pharynx harbor *S. aureus* (6). *S. aureus* carriage rates have been reported in various pediatric populations in the world. Immergluck et al. reported that *S. aureus* carriage rate was 18.6% in a total of 291 children (7). In another study, nasal carriage rate was reported as 24.4% in healthy children (8). Kluytman et al. screened a total of 13,873 people in different studies and reported carriage rates between 19.0% and 55.1% (mean:37.2%) (9). Wertheim et al. reported that *S. aureus* nasal carriage was 24%, and carriers had a three-fold higher risk than non-carriers of acquired nosocomial *S. aureus* bacteremia (6). It was found that the prevalence of nasal carriage of *S. aureus* in the US population was 32.4% (10). In Turkey, nasal *S. aureus* carriage rates were found to vary from 19.1 to 38% in several studies (4, 11-14). In previous studies, the association between *S. aureus* nasal carriage and predisposing risk factors such as frequent hospital contact, antibiotic use history within past six months, family member working in a hospital or clinic, educational level of the mother and father, chronic illnesses, age, sex, and ethnicity have been investigated. A family member employed in a hospital or clinic, family size, and education of parents were found to significantly increase the risk of nasal *S. aureus* carriage (4, 15-17). In our study, antibiotic use history within the past six months, family member employed at a hospital or clinic, smoker in the household, mother's education, more than three household member and sex were associated with nasal *S. aureus* carriage. However, hospitalization within 12 months, having chronic diseases, having a family member with chronic diseases, father's education were not determined as a potential risk factor for nasal *S. aureus* carriage. As a result, nasal *S. aureus* carrier rates were high and some traditional risk factors were associated with nasal *S. aureus* carriage in Turkish elementary school children.

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