



Original article

# Prevalence of *Staphylococcus aureus* and antibiotic resistance in children with atopic dermatitis in Arar, Saudi Arabia

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## Abstract

**Background:** Atopic dermatitis is a chronic inflammatory skin disease which typically affects children during the first year of life. Children with atopic dermatitis often have infective exacerbations which are treated with antibiotics and/or antiseptics. The most common infective cause is *Staphylococcus aureus* (*S. aureus*) with a trend toward antibiotic resistance. *S. aureus* is one of the important microorganisms of normal skin flora. Bacterial skin flora of patients with atopic dermatitis differs from that of healthy people. Atopic dermatitis skin provides a favorable environment for colonization and proliferation of *S. aureus*.

**Objectives:** The aim of this study was to detect the prevalence of *S. aureus* colonization in Saudi children with atopic dermatitis attending the Experience specialist center for dermatology and Laser surgery. Secondary aims were to study the different factors which affect colonization of *S. aureus* in atopic dermatitis skin, and the antibiotic sensitivity pattern of isolated strains.

**Methods:** Sixty patients with atopic dermatitis were selected from the Experience Specialist Center for Dermatology and Laser Surgery in Arar. Patients were examined, and the severity of the disease was determined using a standardized scale: Scoring Atopic Dermatitis (SCORAD). Two skin swabs were taken from each patient for culture and sensitivity, one from the worst area of atopic dermatitis and the other from non lesional skin. Also fifteen skin swabs were also taken from the skin of healthy children.

**Results:** Skin colonization with *S. aureus* is more in skin lesion than in non lesional skin, and is minimal in the skin of healthy children. The colonization in skin lesion is 65% (39 out of 60), and 30% in non lesional skin (18 out of 60), and 13.33% (2 out of 15) in the skin of healthy children. The difference is statistically significant ( $p = 0.0001$ ). The results showed that colonization of *S. aureus* is directly proportional to the severity of the disease. It was 100% (7 out of 7) in severe cases, 77.78% (14 out of 18) in moderate cases, and 51.43% (18 out of 35) in mild cases. The difference is statistically significant ( $p = 0.02$ ). The results showed a direct relation between the colonization of *S. aureus* and age of the patient. The colonization rate was 41.38% in the first group ( $\leq 2$  years), 81.82% in the second group ( $> 2$ –12 years), and 100% in the third group ( $> 12$  years). The difference was statistically significant ( $p = 0.0006$ ). Also the colonization rate of *S. aureus* is more in males than females but the difference is statistically insignificant ( $p = 0.6$ ).

**Conclusion:** 65% of Saudi children with atopic dermatitis are colonized with *S. aureus* in their skin lesions. The rate of colonization is affected by severity of the disease and by the age of the patient.

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**Keywords:** Atopic dermatitis; *Staphylococcus aureus*

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## 1. Introduction

Atopic dermatitis is the commonest chronic cutaneous disease of childhood in the first years of life (Ricci et al., 2012), it is often the first manifestation of allergic diseases (Zheng et al., 2011). Although the etiology of atopic der-

matitis remains unknown, evidence suggests that both genetic and environmental factors play a role in determining both the susceptibility and the severity of the disease (Bieber and Novak, 2009).

The skin of patients with atopic dermatitis can be persistently colonized with *Staphylococcus aureus* on both lesional and non lesional skin (Matsui et al., 2000). *S. aureus* colonization density generally correlates with the severity of atopic dermatitis. Many studies showed a significant correlation between the severity of the disease and *S. aureus* skin colonization in the patients (Farajzadeh et al., 2008; Pascolin et al., 2011). Because of the association of *S. aureus* colonization with the severity of atopic dermatitis, some practitioners advocate anti streptococcal treatment. Most isolated *S. aureus* strains are increasingly resistant to many commonly used antibiotics including penicillins, macrolides, and gentamicin. Therefore, conventionally used antibiotics may be ineffective nowadays. However the majority of *S. aureus* strains still remain sensitive to penicillinase-resistant e.g. flucloxacillin or other antibiotics such as fusidic acid and vancomycin.

The aim of this work is to determine the prevalence of *S. aureus* colonization in the skin of atopic dermatitis patients in Arar, Saudi Arabia, and correlate it with the severity of the disease. Also to test the isolated strains for the commonly used antibiotics.

## 2. Patients and methods

Sixty patients with atopic dermatitis were selected from the Experience Specialist Center for Dermatology and Laser Surgery in Arar, Saudi Arabia from October 2012 to April 2013. Their ages ranged from 6 months to 18 years, (Mean  $\pm$  SD:  $4.4 \pm 4.9$  years). They were 36 (60%) females, and 24 (40%) males. Fifteen healthy children without personal or familial history of AD or allergic diseases, served as the control group (9 females and 6 males) their ages ranged from 1 to 15 years with mean age ( $6.9 \pm 6.2$  years). Patients who were under antibiotic therapy were excluded from the study. The diagnosis of atopic dermatitis was made using the criteria of (Eichenfield et al., 2003). Severity of atopic dermatitis was graded according to SCORAD (Scoring Atopic Dermatitis) (Oranje et al., 2007).

All the patients were subjected to:

- 1- *History taking*: including personal history (name, age and sex), frequency of flare, associated itching, body regions affected, sleep disturbance, and family history of atopic dermatitis.
- 2- *Clinical examination*.
- 3- *Skin swabs*: Skin swabs were collected from skin lesions and non lesional areas from patients with AD and also from healthy controls skin (from ante cubital fossae). The swabs were first dipped in sterile saline and an area of skin  $1 \text{ cm}^2$  in area was rubbed

Table 1  
Study group according to age, sex and severity of the disease.

	No.	%
<i>Sex</i>		
Female	36	60
Male	24	40
<i>Age (years)</i>		
$\leq 2$	29	48.3
2–12	22	36.7
>12	9	15.0
<i>Severity</i>		
Mild	35	58.3
Moderate	18	30.0
Sever	7	11.7

for 30 s. Swabs were incubated on nutrient agar, blood agar, and manitol salt agar incubated aerobically at  $37^\circ\text{C}$  for 24–48 h.

*S. aureus* are identified by: Gram positive cocci in groups, golden yellow colonies on agar,  $\beta$  hemolysis on blood agar, positive coagulase test and positive catalase test (Chessbrough, 2006).

-*Antibiotic sensitivity test* was done according to the Clinical and Laboratory Standards Institutes (CLSI, 2011), using Vancomycin, Erythromycin, Gentamycin, Penicillin, Ampicillin, fusidic acid and Flucloxacillin antibiotics.

## 3. Results

The results of this study are shown in the following 6 tables Tables 1–6 and 4 figures Figs. 1–4.

## 3. Discussion

The results of our study (Table 2 and Fig. 1) showed that 65% (39 out of 60) of atopic dermatitis patients was colonized with *S. aureus* in their lesional skin, compared to 30% (18 out of 60) in non lesional skin of AD patients, and to 13.3% (2 out of 15) in the skin of normal control. This difference is statistically significant ( $p = 0.0001$ ). This is in agreement with the results of other studies that have described the colonization of AD patient skin with *S. aureus*. Gomes et al. (2011) found that out of 100 patients with atopic dermatitis, 57 (57%) were colonized by *S. aureus* in their lesional skin. A nearly similar result (69.7%) was recorded by (Al-saimary et al., 2005). But different isolation rates were also reported by different studies. The rate ranges from lower ratios: 42.5% by Pezesk Pour et al. (2007), to 48.5% (Hon et al., 2005) to higher ratios: 86% (Gilani et al., 2005) and up to 100% (Guzik et al., 2005).

This variation in the prevalence of *S. aureus* in AD patients may be attributed to the fact that majority of individuals are colonized only intermittently by *S. aureus* as stated by Nada et al. (2012), and therefore *S. aureus* is

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