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Original article

The frequency of Staphylococcus aureus in atopic dermatitiscases in Kirkuk City, Iraq

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ARTICLEINFO

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ABSTRACT

The purpose of the current research was to determine the frequency of S. aureus in patients with atopic dermatitis(eczema) in the city of Kirkuk. Anoverall of 102 samples from the affected skin area with atopic dermatitis (AD) were obtained. Additionally, 52 skin samples from 52 individuals were collected that were identical in age and gender to the patients' skin as a control group. These samples were compared to the affected areas of skin. All patients and controls were transported to the Republic Al-Jumhuriya General Hospital in Kirkuk during August 2021 and July 2022. A large portion of the skin scrabs from patients and controls were quickly evaluated on the surface of specific media before being isolated and identified as S. aureus. Several different biochemical and enzymatic methods have been employed to authenticate the suspected organisms. Age, sex, disease duration, severity, and family history had a decreased prevalence of Staphylococcus aureus isolated from patients. 55/102 (or 55%) of the 102 samples from patients had positive results for S. aureus isolation, in contrast, only 11/52 (or 21%) of the 102 samples from the control group had positive results. The frequency of moderate cases was higher than that of moderate and severe atopic dermatitis cases (56.57 %>25.08 %>21.38 %), and the difference was statically significant between the two categories (P<0.05). The distribution of age was not have a substantialinfluence on the results; 19 patients (32.48%) had acute atopic dermatitis, and 38 (69.6%) had chronic atopic dermatitis. The number of males was 1.25 times the number of females. Atopic dermatitis is closely linked to S. aureus infections, and the frequency of eczema diseases is higher in families with history of atopic dermatitis. It's also beneficial to utilize the recently developed primers because they demonstrated a high degree of productivity and effectiveness in this study.

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Introduction

The purpose of this research was to discover the virulence factors of S. aureus, the bacterium that causes atopic dermatitis.[1,2]. Because of its extreme versatility, the pathogenic bacterium S. aureus can causevarious diseases, some of which are lethal, as a result of its extreme flexibility.[3,4]. S. aureus is significant to both humans and animals, but it also produces diseases in animals as a result of the toxins it releases. These diseases include toxic shock syndrome (TSST), staphylococcal food poisoning, Kawasaki's syndrome, etc. Other infections, such as the superficial skin ulcer, may also occur.[5]. Members of the family that includes over 20 different species of staphylococcal toxins (considered to be pyrogenic) and streptococcal toxins that are functionally associated are likely to share similar sequences.[6,7]. A variety of detrimental human diseases are caused by staphylococcal toxins such as TSST and food poisoning. Those with eczema are particularly vulnerable to infection with this bacterium, as it is the leading cause of death, which affects 10%-20% of adolescents.

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Those who are most vulnerable are those who have a tendency to skin diseases. This pathogen is associated with the itching excruciating as a side effect of its disease. [11,12] S. aureus is common on human skin and other membranes. It's associated with multiple skin diseases, including eczema. Eczema is often called a long-term illness of the skin that is characterized by inflammation, irritation, and the development of dry, scaly patches. [1,13]

The relation between S. aureus and eczema have been inspected by many studies and considered that the frequency of S. aureus infection is higher in individuals with AD. [14] Many patients with AD have bacteria, such as S. aureus, that cause the disease for different reasons. [15] The patient's skin is susceptible to infection, this is because their barrier to infection is weakened. [15] Disruption of the epidermis's barrier may be caused by the impaired activity of lipids and proteins that are typically involved in protection against microbial intrusion. [16]

The long-standing inflammation of atopic dermatitis increases the likelihood of bacterial colonization. [17] Toxins and enzymes are among the virulence factors released by S. aureus, these factors can enhance the irritation of the skin and increase the severity of eczema symptoms. [18] Additionally, individuals who have S. aureus on their skin are more likely to get skin infections and skin flares-ups associated with atopic dermatitis.

Other research has demonstrated that 80-100% of atopic individuals have skin infections with S. aureus, this is linked with a prevalence of 1-3% in adults and exacerbations caused by enterotoxins. These diseases are typically triggered by the same people as children[19].

The process of S. aureus elimination from patients is often imperative to reduce the severity of purulent skin diseases. Strategies to regulate the colonization of S. aureus are frequently employed to address atopic

dermatitis[21]. The options for treatment include topical or systemic antibiotics that are used to reduce the amount of the bacteria on the skin, as well as medications that maintain and repair the barrier to prevent infection. Understanding the intricate relationship between S. aureus and atopic dermatitis is crucial to developing effective treatment strategies that will alleviate the symptoms of patients with this debilitating skin condition [22].

The purpose of this research was to determine the amount of time skin lesions are present in individuals with eczema who are admitted to Al-Jumhuriya General Hospital in Kirkuk.

Methodology

The Collection of Samples and case definition:

A total of 102 skin lesion samples were gathered from patients of different ages living in the city of Kirkuk with symptoms of acute or chronic atopic dermatitis. Questions that were asked of each patient included gender, age, the duration of his infection, his family's history, whether he had been treated, and the admissiondate. The analysis of atopic dermatitis in the patients was verified by a dermatologist at the aforementioned clinic. The instances employed in this investigation were chosen according to the guidelines of [23]. These individuals did not take any topical antibiotics, antihistamines, or antibiotics during the two weeks preceding the exam. 52 individuals between the ages of 2 and 35 served as the control group but without eczema or other allergy diseases.

Identification and Isolation of Staphylococci. aureus originating from a skin lesion:

Samples were obtained using skin swabs, fluid from blisters that are released, or scraping tissue. The samples were then inserted into sterile containers with two milliliters of sterile filler material. They were then placed in test tubes that were sterile as well as 2 ml of sterile media for travel. The primary methods employed to assess each isolate were Gram staining and biochemical testing; each skin swab was cultivated on nutrient agar, 5% human blood agar, and mannitol salt agar. [24]

The shape and cultural attributes of the colonies were altered after being incubated overnight at 37°C. After being cultured on mannitol agar at a concentration of 7.5% (overnight at 37°C for 24 hours), each isolate that was mannitol-fermented. The bacterial strains were further evaluated via growth on colorimetric agar, this agar is specifically designed to identify and isolate S. aureus. This is illustrated in Figure 1..



Figure 1: Staphylococcus aureus colonies on Chrmoagar (Thomas, 2007)

Catalase examination:

The catalase test is employed to assess the capacity of the enzyme catalase to differentiate between Staphylococci (catalase +ve) and Streptococci (catalase -ve). Additionally, bacteria utilize the positive catalase enzyme in the presence of hydrogen peroxide to convert it into water and oxygen. A hydrogen peroxide solution is sprayed onto a sample colony on a microscope's slide in order to recognize the presence of catalase. This causes the oxygen to be released and bubbles to form on the slide..

Coagulase test:

The coagulase enzyme is studied in both its bound and free form. In this experiment, 0.5 ml of human blood and 0.5 ml of the bacterial colony mixture are combined and then incubated at 37 degrees Celsius. The composition of fibrin in the coagulase's clot is evaluated during 4 hours of constant plasma flow. S. aureus strains cause clot formation.

Preservation and Upkeep of Bacterial Isolates:

Bacterial isolates were kept in 4C on nutrient agar slants. Every month, all isolates were kept alive (short-term maintained)Isolates were maintained at -70°C (deep frozen) for several months in nutrient broth supplemented with 15% glycerol until use..[25].

Frozen and Preserved Stock Culture Subculturing: We subcultured frozen and preserved stock cultures on new blood agar plates, after which we let them incubate aerobically for twenty-four hours at 37ºC.

Statistical Analyses:

All statistical analyses were performed using SPSS version 18.0 for Windows, Inc. For descriptive stastics, mean plus minus standard deviation was used for quantitative data while number (percentage) was employed for qualitative data. For all tests,the probability value of < 0.05was regarded significant. [25].

The Results

Subjects and Arrangement

The findings are based on 102 instances of atopic dermatitis in total; dermatologists confirm the clinical diagnosis of atopic dermatitis patients using the criteria 52 participants make up the control group[26]..

The overall number of atopic dermatitis patients assessed (55 cases, or 55%) and the total number of control group cases (11 cases, or 21%) associated with S. aureus positive cases showed significant statistical differences (P< 0.05), according to this research (Table 1).

The topic of dermatitis and Staphylococcus aureus positivity (table -1): Compared to controls, individuals with atopic dermatitis had positive Staphylococcus aureus test findings.

Cases	positive cases	negative cases	Total cases
(AD) patients	55 (55%)	47(47%)	102
Control group	11 (21%)	41 (81%)	52
Total cases	66 (43.8%)	88 (58.4%)	154

The P-Value is 8.1E-06. Significant results are obtained at p < 0.05..

The Scoring of Atopic Dermatitis (SCORAD)index [27]was used to gauge the degree of dermatitis, the patients were categorized into three sets: mild, moderate, and severe (Table 2). The occurrence of moderate AD (56.56%>25.08%>21.38%) was greater than that of moderate to severe AD. The average severity, range, and average duration of severe, mild, and moderate cases were 57.26±9.95, 25.18±5.73, and 20.7±4.2, respectively. These findings were not significant at the P level of 0.05 (Table 2). A similar investigation was conducted by [20] who employed the SCORAD index as a means to gauge the degree of atopic dermatitis [27].

A similar investigation was conducted by [20] who employed the SCORAD index as a means to gauge the degree of AD.

Table 2:the occurrence of S. aureus-positive cases of atopic dermatitis among groups and gender.

Control group	11 (21%)	41 (81%)	52
Total cases	66 (43.8%)	88 (58.4%)	154

The P-Value is 8.1E-06. Significant results are obtained at p < 0.05..

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Table 2:the occurrence of S. aureus-positive cases of atopic dermatitis among groups and gender.

The atopic dermatitis instances of people	Mild	Moderate	Severe	Total cases
Males	8(24.2 %)	16(51 %)	9(27.8 %)	31(56.57%)
Females	5(17.8%)	16(63.6 %)	6(21.84 %)	25(45.45%)
Total cases	13 (21.38 %)	32(56.56%)	15(25.08%)	56(100%)
Mean ± SD	25.18±5.73	57.26±9.95	20.7±4.2	

It is 0.763454 for the P-Value. If p is less than 0.05, the outcome is not significant..

Of the 58 individuals with AD that were involved in the research, 19 (32.6%) had acute atopic dermatitis, and 39 (69.6%) had chronic atopic dermatitis. The results were notsignificant (P<0.05).

The distribution of S. aureus strains in individuals with AD was based on the duration of their illnesses (Table-3).

Cases of atopic dermatitis patients	Acute	Chronic	Total cases
Males	10(31%)	22(71%)	32 (56.57%)
Females	9 (34.4%)	17(67.8%)	26(45.45%)
Total cases	19 (32.6%)	39(69.6%)	58 (100%)

0.794379 is the P-Value. The significance level of the finding is p < 0.05.

A 39 (69.53%) of the 58 individuals with AD in this research had a family history of AD, and 19 (31.48%) had no family history. Table 4 demonstrates that the results were significant statistically (P<0.05).

Family history is important in the diagnosis of AD.

AD inheritance history in relation to the prevalence of S. aureus isolates is shown in Table 4.

Case studies of atopic dermatitis patients	F.H Positive	F.H negative	Total
Males	26(84.4%)	6(17.8%)	32(55.56%)
Females	13(51%)	13(51%)	26(45.45%)
Total Number	39(69.53%)	19(31.48%)	58(100%)

0.009886 is the P-Value. When p < 0.05, the outcome is significant.

During the first 30 years, 49% of the participants (90.8%) had S. aureus-involved atopic dermatitis, but the P-value demonstrates not significant results (P> 0.05). Table 5 (P<0.05).

Atopic dermatitis, which is limited to certain age groups.

(table 5): S. aureusisolates are distributed based on atopic dermises family inheritance.

Cases of atopic dermatitis patients with family history	1month-10years	11years-20years	21years-30years	31years-40years	41years-50years	Overall
Present	13(37.8%)	11(27.0%)	8(24.3%)	5(10.8%)	0(0%)	37
Absent	7(35.3%)	7(47.05%)	1(11.76%)	0(0%)	2(5.9%)	17
Overall	20(37.03%)	18(33.3%)	11(20.37)	4(7.4%)	1(1.9%)	54

There is a 0.186330 P-Value. The significance level for this result is p < 0.05.The family's history of atopic dermatitis

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