

Isolation of *Staphylococcus aureus* Bacteria from Nasal Swabs from Workers in Restaurants in Kirkuk City

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ABSTRACT

One of the most important problems facing our time is the problem of resistance to various antibiotics, which is a global problem and among the most important types of resistant bacteria is the *Staphylococcus aureus* bacteria resistant to methicillin. In the current study, clindamycin induced resistance was investigated by a D-test method among methicillin-resistant staphylococcus isolates. As 100 samples were collected from the nose of restaurant workers in the city of Kirkuk, 30 samples were positive, including 16 MRSA samples and 14 MSSA samples. resistance in *Staphylococcus aureus* (MRSA & MSSA) to antimicrobial agent (53.33%) resistant to Methicillin, Cefoxitin, Ceftriaxone, Ceftazidime. (63.33%) Vancomycin, (70%) Ciprofloxacin, (60%) Gentamicin, (43.33%) Azithromycin, (50%) Clindamycin, (43.33%) Trimethoprim, 66.66% Tetracycline.

Keywords: Clindamycin inducible resistance, D-test, MRSA, MSSA.

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INTRODUCTION

Staphylococcal resistance to the majority of antibiotics used in the treatment of infection is on the rise, the changing pattern in antibiotic sensitivity has led to interest in introducing clindamycin as a treatment.¹ The Methicillin Resistant *Staphylococcus aureus* (MRSA) strains described (or multidrug-resistant *S. aureus*) for the first time in the early 1960s as a cause of hospital infection responsible for death due to complications arising from some diseases.²

It is a bacterium that is positive for gram stain, positive for examining catalyzes, optional anaerobic, immobile and not forming spores.³ Although it is found naturally in humans on the skin and digestive system, it is one of the dangerous opportunistic nurses, i.e. if any defect or injury to the human skin, an immune system disorder or digestive disorders, it will cause serious infections.⁴ *S. aureus* is one of the leading causes of many different diseases in both hospital and community settings,⁵ Such as skin infections, soft tissues, endocarditis, broken blood, pneumonia, infiltrated skin syndrome, toxic shock syndrome and osteomyelitis.^{3,6} *S. aureus* strains possess several advantages of virulence to enhance infection; These virulent factors facilitate tissue adhesion, escape from innate immune responses, tissue and cellular damage and weakening connective tissues,⁷ as many enzymes, including lipase analyzers, are among them, which is the base material analyzer for the hyaluronidase bond, which helps them to spread intra-

tissue.⁸ One of the most important public health problems recognized around the world is Methicillin-resistant *S. aureus* (MRSA).⁹ Clindamycin, especially (Lyncosamide), is a good alternative for physicians due to its multiple methods of use, whether by injection or orally. It is also an antibacterial against *S. aureus* and distributes well in tissues,¹⁰ After the widespread use of these antibiotics the number of staphylococcus strains resistant to the MLSB antibiotic has increased.^{1,11}

MATERIALS AND METHODS

Sample Collection

Hundred swabs were collected from the restaurant and nose of both sexes, The samples were taken with a sterile swab from the nose of the workers, and they were transferred to the laboratory for the purpose of cultivation in the culture media.

Laboratory Diagnosis

Samples were obtained, immediately after their arrival in the laboratory, on the blood agar and mannitol salt agar Selective medium for *S. aureus*. Where the cotton swab was rotated in a small area of the dish, and then the process of spreading the sample was carried out using a sterile bacterial loop and by planning method and incubated the dishes at a temperature (37°C) for 24 hours. The samples were cultured and diagnosed according to the traditional methods of work mentioned in.¹²⁻¹⁴ The bacteria were identified through conventional laboratory

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methods such as colony shape and color, blood type analysis on blood agar medium, catalase test, slide and tube coagulation test, and standard biochemical reactions.¹⁵

Antimicrobial Sensitivity Test

Diffusion method (Kirby-Bauer method) was used. Bacteria were impregnated with a test tube containing containers on Nutrient broth and incubated for 2–5 hours until the appearance of turbidity, and the trace was loosened using physiological salt solution and compared with the turbidity of the McFarland Tube No. 0.5 (containing approximately 1.5×10^8 cells / ml), Azithromycin and clindamycin were used to detect clindamycin resistance induced by the D-test, The test is positive for the induced resistance of azithromycin-resistant isolates detected by a clindamycin 21 mm region with a flat D-shaped region in the region between the two discs Antimicrobial susceptibility test of the *S. aureus* isolates was performed by agar disk diffusion method according to the Clinical and Laboratory Standards Institute¹⁶ and European Committee on antimicrobial susceptibility testing. Vancomycin zones were measured with transmitted light.

RESULTS

Nasal Carriage Rate of *S. aureus* in Food Holders

A total of 25 (46.66%) Methicillin sensitive *S. aureus* (MSSA) and 45 (53.33%) Methicillin Resistance *S. aureus* (MRSA) isolates were recovered from 100 nasal swab specimen of food holders works in restaurants. The overall carriage rate of *S. aureus* was 30 as shown in Table 1.

Table 1: Prevalence of Staphylococcus aureus (MRSA & MSSA) in nasal carriage.

Nasal carriage	isolates	No. (%)
Positive	Staph.aureus	30 (30%)
	MRSA	16(53.33%)
	MSSA	14(46.66%)
Negative	–	70%
Total Sample	–	100(100%)

MSSA: Methicillin Sensitive *S. aureus*.

MRSA: Methicillin Resistance *S. aureus*.

Table 2: Gender distribution of isolates and ratio of MRSA.

SEX	MRSA	MSSA	TOTAL
Male	15 (50%)	10 (33.33%)	25 (83.33%)
Female	1 (3.33%)	4 (13.33%)	5 (16.66%)
TOTAL	16 (53.33%)	14 (46.66%)	30 (100%)

Table 3: Staphylococcus aureus (MRSA & MSSA) carriers and age group.

Age Group in years	Male		Female		Total
	MRSA(%)	MSSA(%)	MRSA(%)	MSSA(%)	
Less than or equal 19	0	1 (3.33%)	0	0	1 (3.33%)
20-29	8 (26.66%)	7 (23.33%)	0	2 (6.66%)	17 (56.66%)
30-39	5(16.66%)	1 (3.33%)	1 (3.33%)	2 (6.66%)	9 (30%)
40-50	2 (6.66%)	1 (3.33%)	0	0	3 (10%)
TOTAL	15 (50%)	10 (33.33%)	1 (3.33%)	4 (13.33%)	30 (100%)

Ratio of MRSA & MSSA

Our study showed that the number of male food handlers carriers were more than females number 83.33% and 16.66% in Table 2.

Methicillin Sensitive *S. aureus* ratio and Methicillin Resistance *S. aureus* in male were higher than female. AS age distribution of nasal carriage shown in Table 3, the majority of food were young adults aged from (20-29) years. The number of positive cultures of MRSA & MSSA were higher among male 26.66%, 23.33% than those of female 0, 6.66% in age group (20–29) years and (30–39) years respectively. Very low ratio were in older age group (40–50) years in male.

Antibiotic Susceptibility Pattern of *S. aureus* Isolates

Table 4 show rates of resistance in *S. aureus* (MRSA & MSSA) to antimicrobial agent (53.33%) resistant to Methicillin, Cefoxitin, Ceftriaxone, Ceftazidime. (63.33%) Vancomycin, (70%) Ciprofloxacin, (60%) Gentamicin, (43.33%) Azithromycin, (50%) Clindamycin, (43.33%) Trimethoprim, 66.66% Tetracycline.

All isolates of *S. aureus* were sensitive to Linezolid.

DISCUSSION

Food handlers working in restaurant can easily contaminate food with *S. aureus* which is common cause of food poisoning by their cough or sneeze or contact with their nose or skin during food preparation. Total of 100 food handlers in different restaurants examined, (30% n = 30) were carriers of *S. aureus* in their nose. Our data results are converges with previous studied recorded from other parts of the county 30%,¹⁷ 28%,¹⁸ 22.3%.¹⁹ and are in agreement with finding of²⁰ and^{21,22}, who reported *S. aureus* the most common pathogen isolated from food handlers. 79%, 53.3%, 46% respectively.

S. aureus is true pathogenic bacteria included in 40-50 % of healthy peoples carry it in the anterior nostrils of the nose. The similar percentage of *S. aureus* from food holders in Iraqi governorates 'Dhi Qar', Samaraa, Duhok, Baghdad might be due to same microbial community in carriers method of the distribution of specimen collection during the period of study.

Male food handlers (83.33%) were more than female (16.66%), this may be due to customs and tradition community requirements, prevent females from working in restaurants. Similar study conducted by,²³ Some retrospective case-control studies have found that males were one of the risk factor of community-acquired *S. aureus* infections,²⁴ Furthermore variations in results could be referred on many different factors

Table 4: Antimicrobial sensitivity pattern of Staphylococcus aureus isolates to various Antimicrobial agents.

Antimicrobial disc	Staphylococcus aureus isolates	
	Resistant (%)	Sensitive (%)
Methicillin	16 (53.33%)	14 (46.66%)
Cefoxitin	16 (53.33%)	14 (46.66%)
Ceftriaxone	16 (53.33%)	14 (46.66%)
Ceftazidime	16 (53.33%)	14 (46.66%)
Vancomycin	19 (63.33%)	11 (36.66%)
Ciprofloxacin	21 (70%)	9 (30%)
Gentamicin	18 (60%)	12 (40%)
Azithromycin	13 (43.33%)	17 (56.66%)
Clindamycin	15 (50%)	15 (50%)
Trimethoprim	13 (43.33%)	17 (56.66%)
Tetracycline	20 (66.66%)	10 (33.33%)
Linezolid	0	30 (100%)

such as Level of education, habits of food workers, work environment and regulation on inquest.^{25,26}

S. aureus carrier depend on many factors such as sex and age.²⁷ Foods handlers number whose age young is susceptible to the infection by MRSA and MSSA.

The present study showed the distribution of MRSA among age group 20–29 years in male were higher followed by age group 30–39 years about (16.66%). The percentage were declined in age group 40–50 years. Similar study conducted by.^{17,28} The difference in age group of carriers may be due that young people work more in restaurants than the olders.

The prevalence of MRSA of Nasal carriers in our study was 53.33%. Higher MRSA prevalence among food holders of 21.5,¹⁸ 27,²⁹ 28.6,³⁰ 83.3,¹⁷ 92.5,³¹ Was observed in Samaraa, Duhok, Brazil, Thi-Qar Ethiopia, respectively.

While lower MRSA rate 14.3,³² 5.3,³³ 14.54³⁴ was recorded among food handler in Iran. Many factors effected in the distribution of *S. aureus* and MRSA including recurrent antibiotic usage, bad hygienic practices, sharing personal utensils.³⁵

Antibiotic susceptibility results showed high level of drug resistance especially against Tetracycline 66.66%, Vancomycin 63.33%, Gentamycin 60%, (Methicillin, Cefoxitin, Ceftriaxone, Ceftazidime) 53.3%, Clindamycin 50% , All isolates & *S. aureus* were susceptible to Linezolid. Our results are in agreement with previous studies reported from the other parts of the country,¹⁸ and are similar to finding of.^{28,36,37}

Vancomycin is considered one of the last options of treatment for *S. aureus* infection that are resistant to other antibiotics. Analysis of different studies revealed the emergency of VRSA from different parts of neighboring countries.³⁸⁻⁴⁰

Treatment infection caused by VRSA are often very difficult due to cross-resistance of these bacteria to large group of antibiotics. VRSA (17.8%).^{18,29}

The increased in MRSA isolates can be explained in most cases to transferring plasmid encoded with B-lactamase

enzyme which produced by these strains and inactive penicillin is group of antibiotics.⁴⁰

CONCLUSION

Food handlers should have to complete a formal training in food safety and personal hygiene because they might contaminate food with MRSA and spread the disease in community. In addition to use further studies i.e molecular basis to confirm and minimize multidrug resistant *S. aureus*.

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