

**Research Article****Nasal carriage of Methicillin Resistant *Staphylococcus aureus* among Pregnant Women in Khartoum state**Nosaiba Modther Mohamed Alobaid \*<sup>1</sup> and Musa Abdalla Ali \*\*<sup>2</sup>

\* 1 M.Sc student Microbiology Department of Faculty of Medical Laboratory Sciences, AL-Neelain University, Sudan

\*\*2 Assistant professor –Microbiology Department of Faculty of Medical Laboratory Sciences, AL-Khartoum University, Sudan

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**ABSTRACT**

**Back ground:** Methicillin resistant *Staphylococcus aurues* (MRSA) responsible for different Infections. *Staphylococcus aurues* resides mainly in nose of healthy human also can colonize in other sites of the body. Asymptomatic colonization of Methicillin resistant *Staphylococcus aurues* in pregnant women can cause problem to mothers and their infants.

**Objective:** To determine nasal carriage of MRSA among pregnant women in Khartoum state and the antibiotic susceptibility of *Staphylococcus aureus* isolates.

**Method:** A total of 100 nasal swabs were collected from pregnant women, by a sterile cotton swab moistened with sterile normal saline. Then they were cultured on Manitol salt agar and incubated at 37°C for 24hrs, *S. aureus* was identified by colonial morphology, Gram stain, catalase test, manitol fermentation and coagulase test. Detection of MRSA and antibiotic susceptibility test were done by The Kirby-Bauer disk diffusion technique.

**Result:** From 100 samples screened among pregnant women 18 (18%) were *S.aureus*, 3 (16.7%) of them were Methicillin resistant *S.aureus* (MRSA) and 15 (83.3%) were Methicillin sensitive *S.aureus* (MSSA). The susceptibility test of *S.aureus* isolates showed sensitivity to all antibiotic used in this study (100% for Vancomycin 94.4% for Gentamycin, Clindamycin, Rifampin and 83.3% for Erythromycin). 2 of MRSA isolates were susceptible to five antibiotics (Gentamycin –Erythromycin – Vancomycin –Rifampin – Clindamycin) and 1 of MRSA isolates was resistant to 4 antibiotics and showed sensitivity only to Vancomycin.

**Conclusion:** this study revealed that rate of Methicillin resistant *Staphylococcus aureus* among pregnant women in Military and Obstetrics hospital in Khartoum state moderately low (3%) and there were no effective resistances appear among *S.aureus* isolates in antibiotic susceptibility pattern used.

**Keywords:** Nasal carriage, Methicillin resistant *Staphylococcus aureus*, pregnant women.

**INTRODUCTION:**

*Staphylococcus aureus* is both a commensal bacterium and a human pathogen. Organism possesses a variety of virulence factors, including adhesion molecules, cell wall peptidoglycan, extracellular enzymes, and toxins<sup>(1)</sup>. Patients colonized with *S. aureus* are at risk to develop invasive infections compared to noncolonized patients<sup>(2)</sup>. Colonization of the anterior nares in ~37% of the population is a major risk Factor for severe *Staphylococcus*

*aureus* infections<sup>(3)</sup>. Methicillin-resistant *S. aureus* (MRSA) was a nosocomial pathogen, but in the 1990s, MRSA spread into communities worldwide<sup>(4)</sup>. Resistance to methicillin in *S. aureus* is mediated by PBP2a, a penicillin-binding protein with low affinity to beta-lactams, encoded by the *mecA* gene<sup>(5)</sup>. *S. aureus* became resistant to penicillin in 1959 when methicillin was introduced to treat the infection caused by it. In 1961 Methicillin-resistant *S.aureus*, MRSA was discovered<sup>(6)</sup>; transmission of MRSA could be acquired from

\*Corresponding author: Nosaiba Modther Mohamed Alobaid | E-mail: nosaiba33@gmail.com

the air, from the hair and hands of personnel, and from inanimate objects<sup>(7)</sup>. MRSA is an important emergene pathogen responsible for modest burden of puerperal infections and associated costs<sup>(8)</sup>.

The Result in study of nasal carriage of MRSA among pregnant women in Karnataka state in India at 2015, 100 nasal swab were collected, thirty (30%) of pregnant women colonized with *S.aureus*, twenty (20%) were methicillin resistant *S.aureus*<sup>(9)</sup>.

In 2012 in Cartagena, Colombia there was study in 100 pregnant women 34 of them were colonized with *S.aureus*; 29 only in the nares, 3 in the vagaina and 2 at both sites. Colonization of pregnant women with *S.aureus* was more common in the Nares than in the vagina or at both sites [29/34 (85.3%) vs. 3/34 (8.8%) and 2/34 (5.9%)]. From the total of participants, obtained 36 *S.aureus* isolates, nine of which (25%) were MRSA, one was from the vagina; thus, the overall MRSA colonization rate among pregnant women was 9 %<sup>(10)</sup>. Another study in 722 pregnant women attending University of Uyo Teaching Hospital, Nigeria 180(23.3%) of them harboured nasal MRSA while 592 (76.7%) had Methicillin Sensitive *Staphylococcus aureus*<sup>(11)</sup>.

The aim of this study was to isolate and identify Methicillin resistant *Staphylococcus aureus* among pregnant women and to determine the antibiotic susceptibility of *Staphylococcus aureus* isolates.

#### **Material and method:**

##### **Study design:**

This present study was Descriptive cross-sectional study consenting pregnant women in Military and Obstetrics hospital during May to July 2017, 100 pregnant women were involved.

##### **Subject selection:**

Pregnant women in Military and Obstetrics hospital during May to July, 2017 were included in this study. Pregnant women with HIV/AIDS, certain medical conditions such as diabetes and other complications that may predispose them to infections were excluded. Approval was

taken from the authority of the hospital, an informed or consent was obtained from each individual, every participant was informed about the research purpose before specimen collection the nasal samples and filling the questionnaire.

#### **Experimental work:**

##### **Specimen collection:**

Nasal swabs were collected from the anterior nares by using a sterile cotton wood swab moistened with sterile normal saline; all the steps were conducted under Aseptic conditions.

##### **Culture of specimen:**

After collection, nasal swabs were streaked on Mannitol Salt Agar under aseptic condition and then were incubated overnight at 37°C for 24hrs.

##### **Identification of suspected colony:**

*S. aureus* was identified using standard methods based on colonial morphology, Gram stain, catalase test, mannitol fermentation and coagulase test.

##### **Screen test for MRSA:**

A suspension equivalent to McFarland 0.5 was prepared from each isolate. A Swab was dipped and surface-plated on Mueller-Hinton agar. Thirty (30) µg Oxacillin disk will placed on the medium, Inhibition zones were measured in mm after 24h of incubation at 37°C and compared with chart and interpreted as sensitive, resist or moderate.

##### **Antibiotic susceptibility test:**

The Kirby-Bauer disk diffusion technique was adopted. Individual discs of the Antibiotics (Gentamycin (10µg) –Erythromycin (15µg) – Vancomycin (30µg) –Rifampin (5µg) – Clindamycin (2µg)) were aseptically placed on Mueller-Hinton agar previously seeded with 0.5 McFarland suspension of each isolate. Plates were incubated at 37°C for 24 Hours and zones of inhibition were recorded.

##### **Statistical analysis:**

Collected data was analyzed using Statistical Package for Social Sciences program (SPSS Inx.,

Chicago, IL., USA) Version 16. The Chi-square test was used to compare between the variables. All p-values less than 0.05 were considered as statistically significant.

### **Result:**

A total of 100 nasal swabs were collected from pregnant women in Military and Obstetrics Hospital of which 18 (18%) were *S.aureus* 3 (16.7%) of them were Methicillin resistant *S.aureus* (MRSA) (3% overall study population) and 15 (83.3%) were Methicillin sensitive *S.aureus* (MSSA) (15% overall study population) figure (1). Antibiotic susceptibility test of *S.aureus* isolates represented that 17(94.4%) *S.aureus* isolates were sensitive to Gentamycin, Clindamycin, and Rifampin and only one isolate was resistant for each one (5.6%), 15(83.3%) of

*S.aureus* isolates were sensitive to Erythromycin and 3(16.7%) isolates were resistant, all *S.aureus* isolates(100%) were sensitive to Vancomycin figure (2). 2 of MRSA isolates Were susceptible to five antibiotics (Gentamycin – Erythromycin – Vancomycin –Rifampin – Clindamycin ) and 1 of MRSA was sensitive only to Vancomycin and resistant to 4 other antibiotics. Demographic and clinical Characteristics Show in table (1).statistical analysis found no significant association between *S.aureus* colonization (including MRSA) and Age, antibiotic intake in last year, history of caesarean delivery, History of Surgical and history of hospitalization. Also it showed significant association between *S.aureus* colonization and gestational age.

**Table 1:**

<b>Age group</b>	<b>Frequency (%)</b>	<b>Nasal carriage of <i>S.aureus</i></b>
(15-20) yrs	17(17%)	4(22.2%)
(21-25) yrs	23 (23%)	5(27.8%)
(26-30) yrs	36 (36%)	5(27.8%)
(31-35) yrs	11(11%)	3(16.6%)
(36-40) yrs	13(13%)	1(5.6%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
<b>Occupation</b>	<b>Frequency (%)</b>	<b>Nasal carriage of <i>S.aureus</i></b>
housewife	92(92%)	17(94.4%)
employee	4(4%)	1(5.6%)
Teacher	3(3%)	0(0.0%)
Student	1(1%)	0(0.0%)
<b>Total</b>	<b>100</b>	<b>18(100%)</b>
<b>Education level</b>	<b>Frequency (%)</b>	<b>Nasal carriage of <i>S.aureus</i></b>
Illiterate	4(4%)	1(5.6%)
Primary	34(34%)	5(27.8%)
Secondary	31(31%)	6(33.3%)
University	31(31%)	6(33.3%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
<b>Antibiotic intake in last year</b>	<b>Frequency (%)</b>	<b>Nasal carriage of <i>S.aureus</i></b>
Yes	42(42%)	6(33.3%)
No	58(58%)	12(66.7%)

Gestational age (week)	Frequency (%)	Nasal carriage of <i>S.aureus</i>
Less than 11weeks	11(11%)	4(22.2%)
(11-15) weeks	3(3%)	0(0%)
(16-20) weeks	17(17%)	0(0%)
(21-25) weeks	14(14%)	1(5.6%)
(26-30) weeks	16(16%)	2(11.1%)
(31-35) weeks	21(21%)	6(33.3%)
(36-40) weeks	18(18%)	5(27.8%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
Parity	Frequency (%)	Nasal carriage of <i>S.aureus</i>
Multipara	75(75%)	14(77.8%)
Nulipara	25(25%)	4(22.2%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
Caesarean delivery	Frequency (%)	Nasal carriage of <i>S.aureus</i>
Yes	17(17%)	5(27.8%)
No	83(83%)	13(72.2)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
Surgical History	Frequency (%)	Nasal carriage of <i>S.aureus</i>
Yes	31(31%)	7(38.9%)
No	69(69%)	11(61.2%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>
History of Hospitalization	Frequency (%)	Nasal carriage of <i>S.aureus</i>
Yes	43(43%)	9(50%)
No	57(57%)	9(50%)
<b>Total</b>	<b>100(100%)</b>	<b>18(100%)</b>

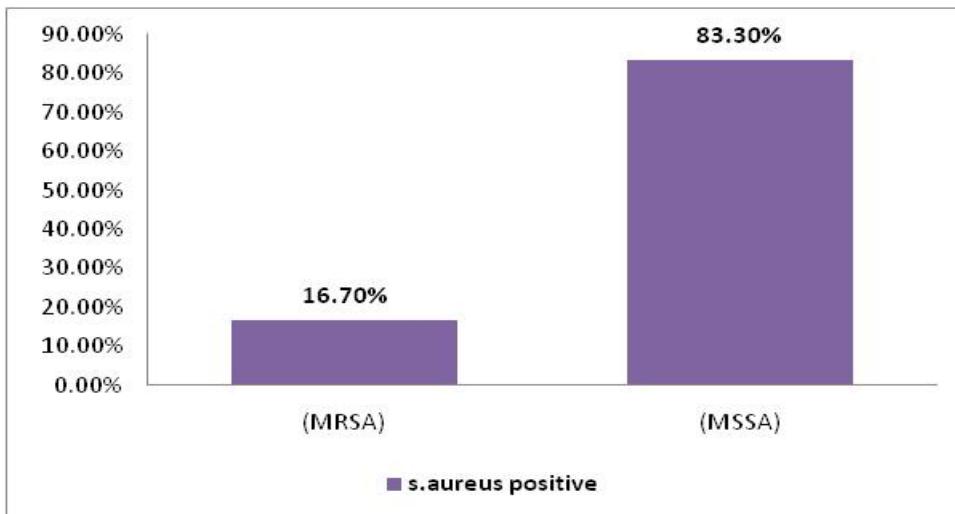
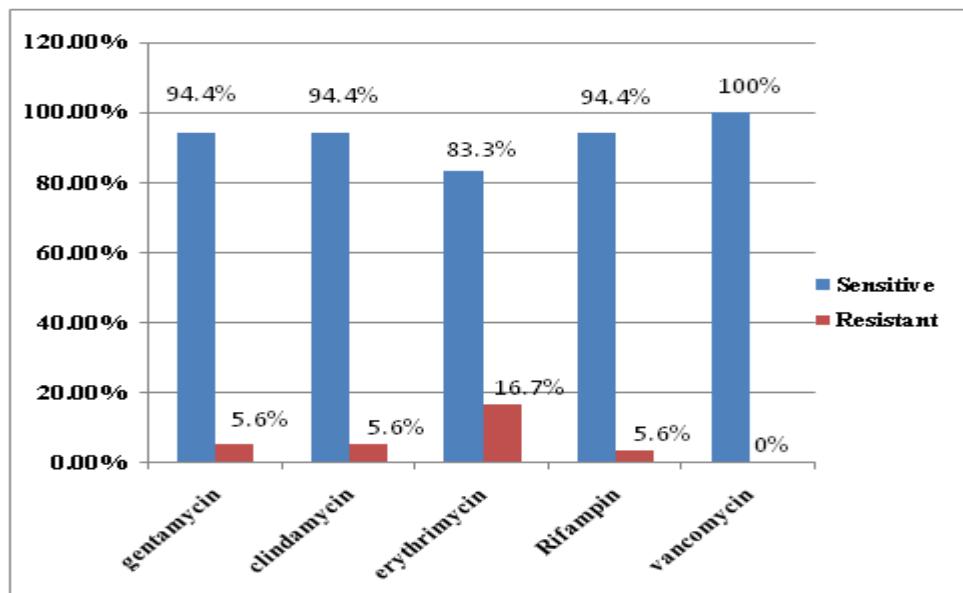


Figure 1: MRSA and MSSA among *S.aureus* isolates in pregnant women.Figure 2: Antibiotic Susceptibility test of *S.aureus* isolates among pregnant women

### Discussion:

This study revealed that 18 (18%) of pregnant women were a carrier of *S. aurues* strain. Of these, 3(16.7%) were MRSA and 15(83.3%) were MSSA. MRSA is an important problem affecting pregnant women most often in the form of skin or soft tissue infections<sup>(12)</sup>. Also can cause necrotizing pneumonia, Pleural empyema, necrotizing fasciitis, myositis, and severe sepsis with purpura Fulminans and the Waterhouse-Friderichsen syndrome. Bacteremia, endocarditis, Septic arthritis and osteomyelitis<sup>(13)</sup>. Infants born to mothers with staphylococcal colonization Were more likely to be colonized, and early postnatal acquisition appeared to be the primary mechanism<sup>(14, 15, 16)</sup>. In this present study 100 pregnant women were enrolled, the result showed 18(18%) *S.aureus* were isolated and 3(3%) were Methicillin resistant *S.aurues* these result slightly similar To which done in USA by Beigi, R., and J. Hanrahan (2007) studied of nasal carriage of MRSA Among pregnant women admitted to Metro Health Medical Centre, of the 96 sample collected, 21 (22%) strain of *S.aureus* were isolated and 2(2.1%) were methicillin resistant *S.aureus* (MRSA)<sup>(17)</sup>. However it differ from study done in India by Basher, Azadeh, and Senthil Kumar

(2015) who found of 100 pregnant women 30(30%) were identified as nasal carriers of *S.aurues* and 20(20%) were Methicillin resistant *S.aurues* (MRSA)<sup>(9)</sup>. From the study there was no significant association between *S.aureus* colonization (including MRSA) and age, Antibiotic intake, caesarean delivery, surgical history and history of hospitalization this result Similar to study done in Nigeria by Etok, C. A., et al (2012) who found that negative correlation between MRSA and age, antibiotic intake and previous hospital Admission<sup>(11)</sup>.there was significant association between *S.aureus* colonization among pregnant women and gestational age, colonization increased between 31 weeks and 35 weeks of gestational age .The susceptibility test of *S.aureus* isolates a among pregnant women showed that 1 isolate was resistant to each of Gentamycin, Clindamycin, and Rifampin , 3 isolates were resistant to Erythromycin and no resistance for Vancomycin. 2 of MRSA isolates represented no resistance for the five antibiotics and one isolate was resistant to 4 antibiotics (Gentamycin, Clindamycin, Rifampin, Erythromycin) and no resistance for Vancomycin.

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