

## The effectiveness of the antibiotics used on methicillin-resistant *staphylococcus aureus* for patients attending the surgery clinic at Misurata Medical Center

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### Abstract:

The study was conducted on attending cases at the surgical clinic at the Misurata Medical Center during the time period from 8 November to December 27 of 2019 of both sexes and the sample was random for patients and no age group was targeted and it included diabetic foot patients, gallbladder operations, appendicitis, hernias and other operations, Where he used the antibiotic Cefoxitin to identify the bacteria resistant to methicillin, and 8 antibiotics which are (Ampicillin, Ceftriaxone, Ciprofloxacin, Fusidic acid, Erythromycin, Vancomycin, Amoxicillin clavulanic acid, Trimethoprim- sulphamethoxazole(Bactrim)).

Among the results obtained during the study was the number of cases 120 and the proportion of men 50%, while females 50% and ranged ages (5-94) years, were isolated *Staphylococcus aureus* bacteria found 18% and *Staphylococcus epidermidis* 21%, and other bacterial species 16%, while 45% did not have bacterial growth, and the percentage of Methicillin Resistant *Staphylococcus aureus* (MRSA) is 17%, and it was present in most isolates from diabetic foot and gallbladder processes.

In addition, most isolates are staph bacteria resistant to methicillin, resistant to multi antibiotics in most of them by more than 50%.

This indicates that these bacteria are more prepared than any other bacterial type to resist antibiotics, and this excludes care by the patient not to randomly use antibiotics.

**Keywords:** antibiotics, methicillin-resistant *Staphylococcus aureus*, the surgery clinic Misurata Medical Center.

## مدى فعالية المضادات الحيوية المستخدمة على البكتيريا العنقودية المقاومة للميثاسلين للمرضى المترددين على عيادة الجراحة في مركز مصراتة الطبي.

الملخص:

أجريت الدراسة على حالات المترددة على العيادة الجراحية بمركز مصراتة الطبي خلال الفترة الزمنية من 8 نوفمبر إلى 27 ديسمبر 2019 من كلا الجنسين وكانت العينة عشوائية للمرضى ولم يتم استهداف أي فئة عمرية وشملت مرضى القدم السكرية وعمليات المرارة والتهاب الزائدة الدودية والفتق والعمليات الأخرى ، حيث استخدم المضاد الحيوي سيفوكسيتين للتعرف على البكتيريا المقاومة للميثاسلين ، و 8 مضادات حيوية وهي ( Ampicillin, Ceftriaxone Ciprofloxacin, Fusdic acid, Erythromycin, Vancomycin Amoxicillin clavulanic acid (Trimethoprim-sulphamethoxazole)Bactrim

ومن النتائج التي تم الحصول عليها خلال الدراسة التي بلغ عدد الحالات 120 مريضا ونسبة الرجال 50% بينما الاناث 50% وتراوحت الاعمار (5-94) سنة تم عزل بكتيريا *Staphylococcus aureus* وجدت 18% و *Staphylococcus epidermidis* 21% والأنواع البكتيرية الأخرى 16% ، وبينما 45% لم يكن لديها نمو بكتيري ، ونسبة Methicillin (MRSA) *Staphylococcus aureus* Resistant هي 17% ، وكانت موجودة في معظم العزلات من القدم السكرية وعمليات المرارة.

بالإضافة إلى ذلك، فإن معظم العزلات عبارة عن بكتيريا Methicillin Resistant *Staphylococcus aureus* ومقاومة للمضادات الحيوية المتعددة في معظمها بنسبة تزيد عن 50%. وهذا يدل على أن هذه البكتيريا أكثر استعداداً من أي نوع بكتيري آخر لمقاومة المضادات الحيوية ، وهذا يستثني حرص المريض على عدم استخدام المضادات الحيوية بشكل عشوائي.

**الكلمات المفتاحية:** المضادات الحيوية ، البكتيريا العنقودية المقاومة للميثاسلين ، عيادة الجراحة ، مركز مصراتة الطبي.

## Introduction

The spread of antibiotic-resistant bacteria is high and may be a direct source of hospital infection (Ashiru-Oredope & Hopkins, 2015; Livermore, 2009), the past decades have witnessed an increase in concern about the spread of these resistant bacteria (Brown *et al.*, 2005; Jones, 2008), despite progress and development in limiting the spread of these bacteria, the diseases and deaths caused by them have not been preserved and therefore need special care by health workers to avoid their spread. (Mulier *et al.*, 2003), the study of composition genetics of bacteria and understanding their patterns of resistance is the helpful way to prevent hospital infections (Farshad *et al.*, 2012), there is a lot of research to assess the prevalence of bacteria that are resistant to many antibiotics in different countries of the world, especially the bacterial type resistant to methicillin, several researches were conducted for nine European countries, which found a prevalence of 39%, and when some countries exceeded 50%, such as Egypt, Jordan, and Malta for the year 2005 (Borg *et al.*, 2007), While another study in Europe, its prevalence rate exceeded 25% for the year 2008 (Johnson, 2011), its prevalence rate reached (16-41)% in Tunisia for the year 2007 compared to the State of Libya 31% for the same year, while in South Africa 24% and the two countries of Egypt and Algeria reached (45-52)% for the year 2005 (Falagas *et al.*, 2013), *Staphylococcus aureus* bacteria are a pathogen that is able to acquire rapid resistance to antibiotics, especially methicillin resistance, which adapts itself to the treatment used and is responsible for many difficult infections that affect humans (Davis *et al.*, 2004), in the United States approximately 60% of infections in the intensive care unit (ICU) that causes its main bacteria-resistant *Staphylococcus* methicillin (Zhang *et al.*, 2015), looking at the stages in the development of the emergence of these bacteria from the beginning of the discovery of penicillin in the 1940's, the infection rate decreased all over the world until the *Staphylococcus* bacteria began to produce lactamase, which in turn destroyed penicillin (Peacock, 2006), This increased the resistance to penicillin and the emergence of a semi-penicillin group, which is methicillin, which resists many genetic variations of the beta-lactase enzyme (Kasper *et al.*, 2015), the infection was controlled by *Staphylococcus aureus* with methicillin, which led to the emergence of the first resistant strain in 1961 for methicillin (Brown *et al.*, 2005; Peacock, 2006), since then bacteria have been found all over the world especially in the auxiliary environment hospitals (Jones, 2008; Reihsaus *et al.*, 2000), where the infection acquired from these bacteria is linked to an increase in the length of stay in the

hospital, mortality and health care costs (Selvey *et al.*, 2000; Shurland *et al.*, 2007), where we find its presence is the main cause of the disease, however there is little information related to this infection in Libya (El-Bouri, 2009), antimicrobial resistance in methicillin-resistant strains is associated with the acquisition of a genetic component called cassette chromosome that carries a *mecA* gene and denotes protein binding to the reduced affinity penicillin 2A and confer resistance to antibiotics (Katayama *et al.*, 2000), a new *mec* variant has been described and called *mec-c*, which shows only 70% of the sequence symmetry of nucleotides with the *mec* gene. In 2011 the MRSA strain containing *mec-C* was isolated and reported to be resistant to ceftioxin (Dupieux *et al.*, 2017).

Antimicrobial resistance is a health problem, especially in developing countries due to the lack of health awareness of the danger of the development of this bacterial species due to the indiscriminate use of the antibiotic so that it can be bought from pharmacies without consulting a doctor and this is the main factor for the spread of resistant bacteria (Sciicluna *et al.*, 2009).

This study examined the prevalence of methicillin-resistant *staphylococcus* bacteria among patients attending the surgery clinic and the effectiveness of the antibiotics used.

### Materials and Methods

**Study location:** The study was conducted on patients attending the surgery clinic at Misurata Medical Center.

**Ethical approval:** It was agreed to take samples from the place of study as well as from patients attending the center.

**Samples collection:** smears were taken from 120 patients in the period from 8 November to 27 December 2019, and the samples were collected in the morning period randomly, covering all ages for both sexes, the study included all patients attending the surgery department or outside it, and whether they are diabetic foot patients, surgeries and wounds.

**Isolate and identify *Staphylococcus spp*:** The smears taken from the patients were transplanted to the blood lease to identify the type of *Staphylococcus* and some differential tests, such as the catalase test, were used to differentiate between *Staphylococcus spp* and *Streptococcus spp*, Coagulation test has also been used to differentiate between *Staphylococcus* species in addition to differential bacterial media Baird parker agar, Mannitol salt agar (Shurland *et al.*, 2007).

**Resistance test *Staphylococcus spp* for methicillin:** Detection of bacterial resistance to methicillin (MRSA) using the antibiotic Cefoxitin 30 $\mu$ g by Mueller Hinton agar using a cotton swab from the bacterial suspension after adjusting its turbidity compared to the McFarland solution (0.5w / v) incubated at 37 ° C for 24 hours, and the damping diameter of the antibiotic was measured (Swenson *et al.*, 2005).

**Resistance test *Staphylococcus spp* for antibiotic:** Working a bacterial suspension and adjusted with McFarland solution (0.5w / v) with a cotton swab, Plan the Mueller Hinton agar and leave the dish for 10 minutes to dry. The antibiotics were placed and incubated at 37 ° C for 24 hours (Bauer *et al.*, 1966), Table (1) shows the antibiotics used.

Table (1): antibiotics used.

antibiotic	Con ( $\mu$ g)
Trimethoprim sulphamethoxazole ( <i>Bactrim</i> ) (SXT)	25
Augmentin (AMC)	30
Vancomycin(V)	5
Erythromycin (E)	15
Fusidic acid (FA)	30
Ceftriaxone (CRO)	30
Ampicillin (AMP)	10
Ciprofloxacin (CIP)	5

## Results and Discussion

The current study was conducted on patients of the surgical clinic at Misurata Medical Center in the aforementioned time period, whether they were cases of accommodation inside or outside the center, the percentage of follow-up cases from divisions was 77%, while out of center was 23%, the study included 120 patients, the percentage of males 50%, while females 50%. While the ages of the cases ranged between 5 to 49 years, as in table (2).

Table (2): The ages of the cases.

Age group (years)	The number of cases affected
(5-30)	<b>36</b>
(31-50)	<b>49</b>
(51-94)	<b>35</b>
<i>Total of cases</i>	<b>120</b>

The frequent cases were counted and I found that most of them were diabetic foot patients at 33%, while the other cases varied from gallbladder, appendix, hernias, and other operations, as in Figure (1).

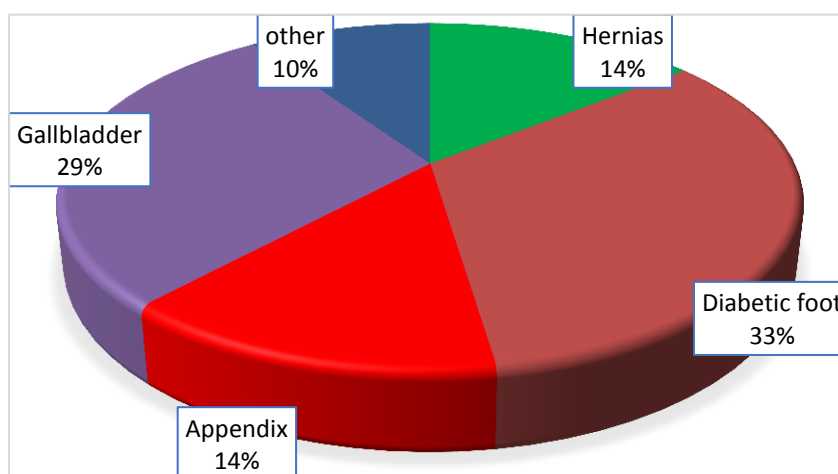


Figure (1): Types of infection.

Smears were taken from patients and bacterial species were isolated *Staphylococcus aureus* bacteria found 18% and *Staphylococcus epidermidis* 21%, while other bacterial species 16%, while 45% did not have bacterial growth as shown in the figure (2).

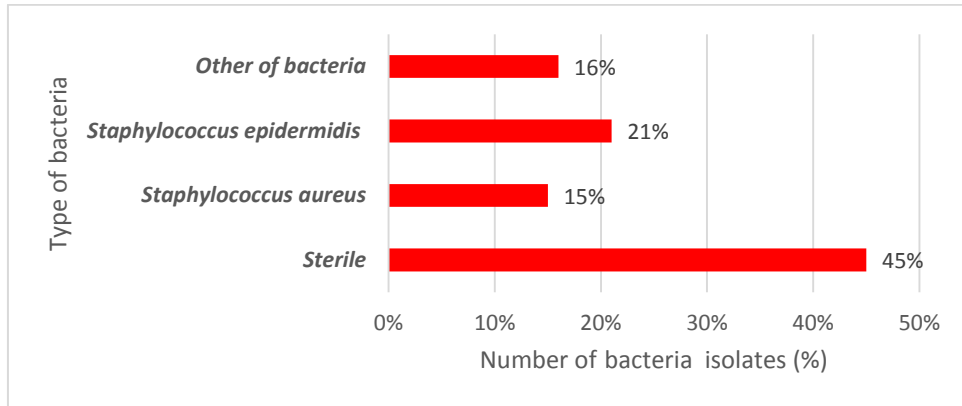


Figure (2): Bacterial types isolated from patients

The study was limited to methicillin-resistant *Staphylococcus spp* bacteria and used the antibiotic Cefoxitin and sensitive bacteria for it, the number of methicillin-resistant bacteria was 21 bacteria and where the methicillin-resistant *Staphylococcus aureus* found 17% while sensitive 30%, while methicillin-resistant *staphylococcus epidermidis* 25% while sensitive 28% as Figure (3) compared to the study in Benghazi bacteria MRSA to 31% (Buzaid *etal.*, 2011).

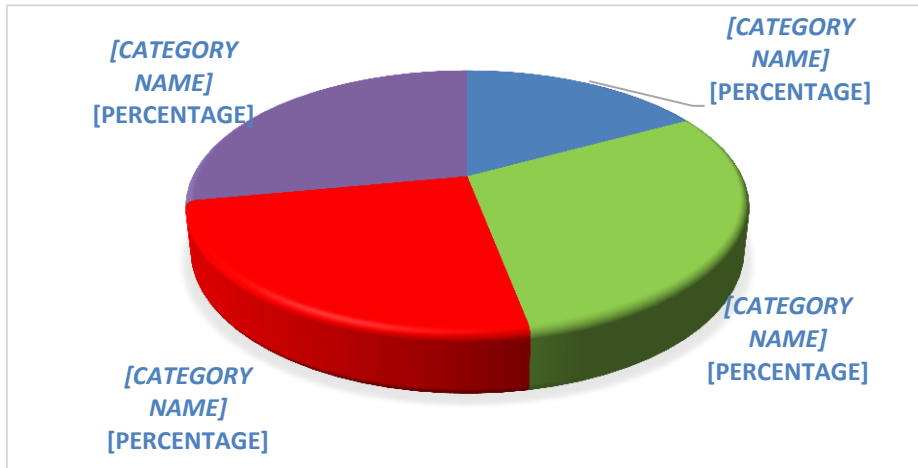


Figure (3): *Staphylococcus aureus* and methicillin resistant.

We find by studying the relationship between the presence of these resistant bacteria and the patient's presence in the past in the surgical department, we

find that there is a strong relationship and this was similar to the study in Pakistan (Hussain *et al.*, 2019), while the relationship of this bacterial type to the patient's age did not have any relationship, these resistant bacteria were not limited to a specific group of patients, likewise when compared to the treatment period of the patient, the length of the infection period had no relation to the presence of these methicillin-resistant bacteria, while comparing the presence of this bacterial type with the type of infection, it was found that it was more closely associated with diabetic foot patients 7 cases (33%) and gallbladder operations 6 cases (29%) and while 3 cases (14%) for both appendix and hernias and other of infection 2 cases (10%) as figure (4).

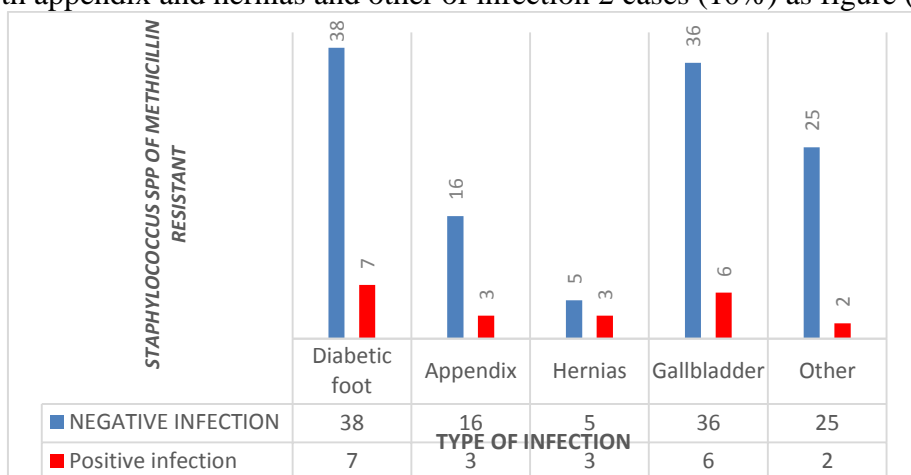


Figure (4): *Staphylococcus aureus* of methicillin resistant in cases.

Through follow-up with patients, it was found that most of them were antibiotic users, and their rate reached 70%, and when the bacteria were isolated from the patients to determine their sensitivity to the antibiotic methicillin, it was found that 21 patients (18%) were resistant to methicillin., although most patients infected with resistant bacteria were not taken an antibiotic during the treatment period, the reason may be the prior use of the antibiotic , this is similar to a study that showed that methicillin-resistant bacteria are resistant to many antibiotics (Zhang *et al.*, 2015), i found that most of the antibiotics had no effect on the bacteria.

In this study, only methicillin-resistant bacteria were targeted and were confined to 21 bacterial isolates, the bacterial isolates were numbered according to the patient's sequence, where the rate of antibiotic resistance ranged (38 - 100%) as figure (5)



This shows that surgical infections are the main source of the presence of bacteria that are resistant to many antibiotics(KON, 2017).

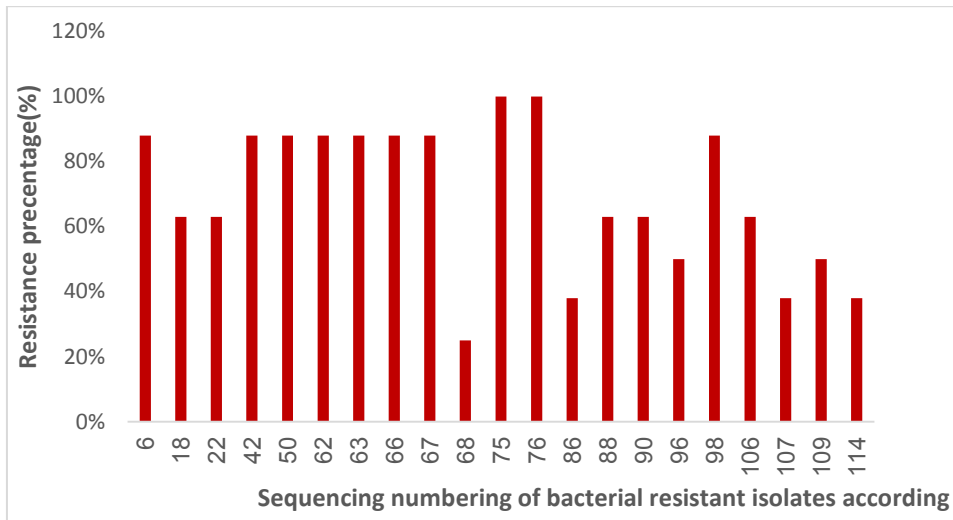


Figure (5): *Staphylococcus aureus* of resistance antibiotic.

### Conclusions

The problem of bacteria that are resistant to many antibiotics, especially the staph bacteria resistant to methicillin. This urgently requires a solution to this problem by establishing monitoring systems that rely on routine tests for anti-microbial sensitivity, and educating health care workers as well as citizens about the risks of indiscriminate use of antibiotics.

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