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Central line-associated infection in the intensive care unit of Misurata Hospital (ICU)

Dr. Yasmin Farag Abushalla

Microbiology Unit, Al-Aswak Health Center, Misurata - Libya.

jasamen84@gmail.com

Abstract:

Introduction: Central venous access requires placement of a large catheter or venous access device in the groin or under the collarbone to deliver medications that cannot be given orally or in the arm. In addition to antibiotics and chemotherapy, this catheter can be used to administer effective drugs in vessels, blood products, and intravenous nutrition. Furthermore, central venous access is also used in intensive care units to assess venous and cardiac function or to provide patients with continuous or intermittent renal replacement therapy, however one of the main issues related to the use of central venous catheters is the possibility of infection caused by microorganisms that can cause local or systemic infections.

Methods: The data was collected from Hospital, Misrata, during the period from January 2021 to August 2022. It included cases who were asked to insert central line catheters in the intensive care unit, in addition to age, gender, type of pathogen, and antibiotics used.

Results: It included 24 cases, the number of women was 14, while the men were 10, the ages ranged from 15-98 years, and they were concentrated in the age groups 15-77 years, and from isolated bacteria. *Acinetobacter spp* and *Staphylococcus spp* (17%), **Klebsiella** *spp* (42%), *pseudomonas spp* and *proteus spp and E. coli* (8%) and *Candida albicans* (3%) And by studying antibiotic sensitivity, it was found that the bacteria showed resistance to all antibiotics except the antibiotic CST. Which showed efficacy on the isolated bacterial species except *Proteus spp.*

Keywords: Infection Central Line, microbes, Intensive Care Unit (ICU), Misurata.

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العدوى المرتبطة بالخط المركزي في وحدة العناية المركزة بمستشفى مصراتة

د. ياسمين فرج ابوشعالة

قسم الاحياء الدقيقة ، المركز الصحي الاسواك، مصراتة، ليبيا

jasamen84@gmail.com

الملخص:

المقدمة: يتطلب الوصول الوريدي المركزي وضع قسطرة كبيرة أو جهاز وصول وريدي في الفخذ أو أسفل الترقوة لتوصيل الأدوية التي لا يمكن إعطاؤها عن طريق الفم أو في الذراع. بالإضافة إلى المضادات الحيوية والعلاج الكيميائي ، يمكن استخدام هذه القسطرة لإدارة الأدوية الفعالة في الأوعية ومنتجات الدم والتغذية الوريدية. علاوة على ذلك ، يتم استخدام الوصول الوريدي المركزي أيضًا في وحدات العناية المركزة لتقييم وظائف الأوردة والقلب أو لتزويد المرضى بعلاج بديل كلوي مستمر أو متقطع ، ولكن إحدى المشكلات الرئيسية المتعلقة باستخدام القسطرة الوريدية المركزية هي احتمال حدوث عدوى عن طريق الكائنات الحية الدقيقة التي يمكن أن تسبب التهابات موضعية أو جهازية.

الطريقة: تم جمع البيانات من مستشفى مصراتة خلال الفترة من يناير 2021 إلى أغسطس 2022. وتضمنت الحالات التي طُلب منها إدخال قسطرة خط مركزي في وحدة العناية المركزة ، بالإضافة إلى العمر والجنس ونوع العامل الممرض. المضادات الحيوية المستخدمة.

النتائج: اشتملت على 24 حالة ، كان عدد النساء 14 ، والرجال 10 ، وتراوحت أعمارهم بين 15-98 سنة ، وتركزوا في الفئات العمرية 15-77 سنة ، ومن البكتيريا المعزولة *Acinetobacter spp* و *Staphylococcus spp* (17%)، *Klebsiella spp* (42%)، *pseudomonas spp* و Proteus *spp* و *E. coli* (8٪) و Candida *albicans* (3٪) ، ومن خلال دراسة حساسية المضادات الحيوية ، وجد أن البكتيريا أظهرت مقاومة جميع المضادات الحيوية باستثناء المضاد الحيوي CST، والتي أظهرت فاعليته على الأنواع البكتيرية المعزولة ماعدا *Proteus spp*.

الكلمات المفتاحية: عدوى الخط المركزي ، الميكروبات ، وحدة العناية المركزة، مصراتة.

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Introduction

Central venous access requires placement of a large catheter or venous access device in the groin or under the collarbone to deliver medications that cannot be given orally or in the arm(Yébenes & Capdevila, 2002), In addition to antibiotics and chemotherapy, this catheter can be used to administer effective drugs in vessels, blood products, and intravenous nutrition(Janum, Zingg, Classen, & Afshari, 2013; Qiu et al., 2020), Furthermore, central venous access is also used in intensive care units to assess venous and cardiac function or to provide patients with continuous or intermittent renal replacement therapy, However one of the main issues related to the use of central venous catheters is the possibility of infection caused by microorganisms that can cause local or systemic infections (Lorente, Henry, Martín, Jiménez, & Mora, 2005).

Which leads to an increase in morbidity and mortality rates among patients, as well as an increase in financial resources and burdens in society(Al-Balas et al., 2017), two main names are used to define vascular catheter-related bloodstream infections: central line-associated bloodstream infections and catheter-associated bloodstream infections, Although they are used interchangeably, there are distinct differences between them. The term central line-related blood infection refers to an infection that occurs in the presence of a central venous catheter within 48 hours after catheter removal(Marschall et al., 2014).

A catheter-associated bloodstream infection is a clinical diagnosis attributable to an intravascular catheterization that can be confirmed by culture(Yébenes & Capdevila, 2002), it is one of the most common nosocomial infections and a major cause of bloodstream infections, especially for intensive care patients. Several recent studies have found that central venous catheters are more infectious than peripheral catheters (Marschall et al., 2014), the Centers for Disease Control and Prevention estimates that there has been 50% decrease in infections in the United States in recent years, but thousands of patients still develop bloodstream infections each year(Horan, Andrus, & Dudeck, 2008).

A study showed that the rate of bloodstream infections associated with central lines in Western European hospitals is 3.5%, while in China it is 48% in intensive care and surgical units, A study reported that staphylococci and streptococci are the most common microorganisms, while in a study in Spain, staphylococci and yeasts are responsible for infections, while recent studies in China and Europe showed that most of the pathogens are gram-negative bacteria (Horan et al., 2008; Meng et al., 2021).

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Central venous catheters have become essential in the management of critically ill patients who require long-term care(Novikov et al., 2012), as a result, the presence of resistant microorganisms is one of the contributing factors to the high infection and mortality rate in intensive care units (Massanari & Hierholzer, 1986).

The current study aimed to identify the most common organisms in blood infection associated with the central line and the extent of bacterial resistance to the antibiotics used.

Materials and Methods

Data collection protocol

The data was collected from Hospital, Misrata, during the period from January 2021 to August 2022. It included cases who were asked to insert central line catheters in the intensive care unit, in addition to age, gender, type of pathogen, and antibiotics used were Imipenem (IMP (10µ), Ceftriaxone (CRO (30 µ), Amoxicillin clavulanic acid (AMC (30 µ), Cefotaxime (CTX (30 µ), Norfloxacin (NOR(10 µ), ceftazidime (CAZ(30µ), Cefoxitin (FOX(30µ), Amikacin (AK (30 µ), Meropenem (MRP (30 µ), Colistin (CST (25 µ) (Miller, Vujcich, & Brown, 2022).

Results and discussion

The current study was conducted by collecting data from patients from the central care department at Hospital, Misrata, including cases of central line catheters, and included 24 cases in the previously mentioned time period, Where the number of women was higher than men as figure (1), and this is not similar to two studies in Australia and Bangladesh (Miller et al., 2022; Saha et al., 2022).

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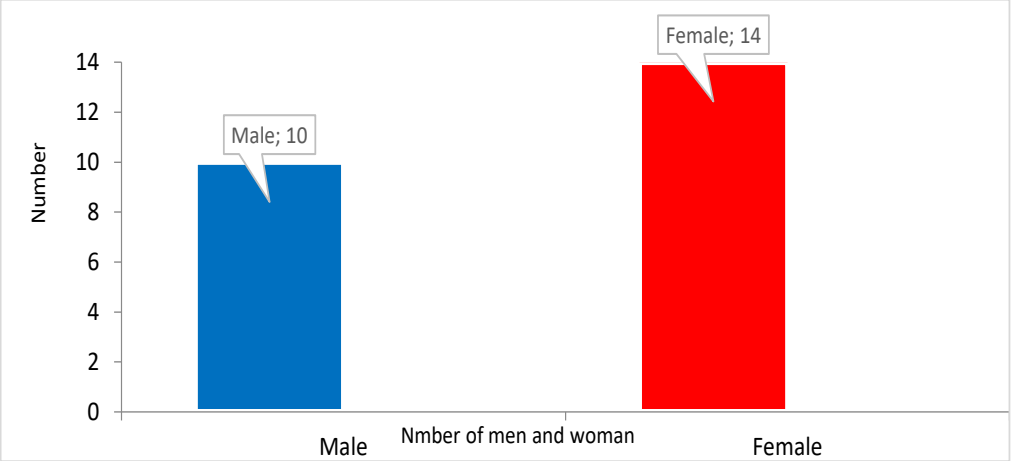


Figure (1): The number of men and women

The age groups ranged from 15-98 years, so we find that most of the cases are from the age groups from 15 to 77 years as figure (2), and this is similar to a study in India(Deb, Mittal, Gaind, & Verma, 2016).

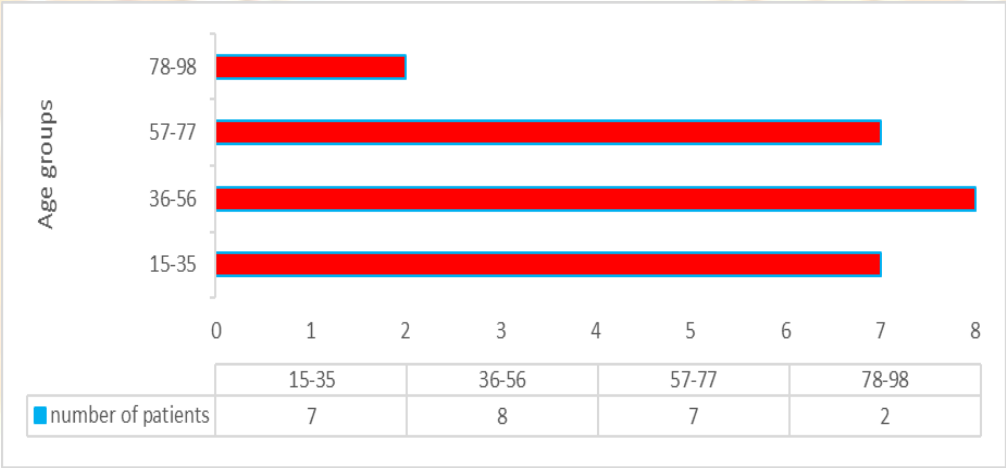


Figure (2): Age groups Figure (2): Age groups

From the data obtained for the isolated organisms, 67% of Gram-negative bacteria, 13% of Gram-positive bacteria, and 20% of yeasts, as shown (3), this is similar to a study in India where most of the bacteria present are *Acintobacter spp*, *Staphylococcus spp*, **E. coli, Klebsiella** *spp* and *Candida albicans* (Sapkota, Mishra, Jha, & Sharma, 2017).

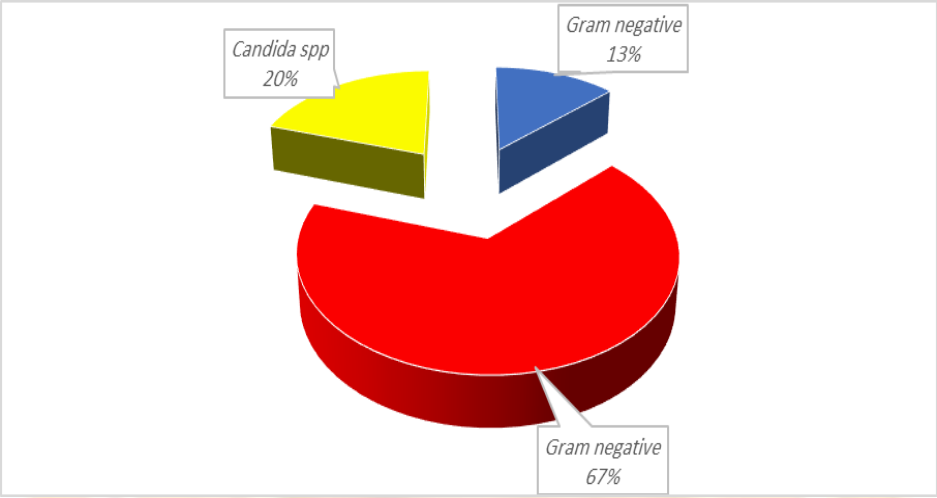


Figure (3): The percentage of isolated organisms

bacteria isolated of study 6 species were *Acinetobacter spp* and *Staphylococcus spp* (17%), **Klebsiella** *spp* (42%), *pseudomonas spp* and *proteus spp and E. coli* (8%)as figure (4) .This is similar to a study in India (Sapkota et al., 2017),

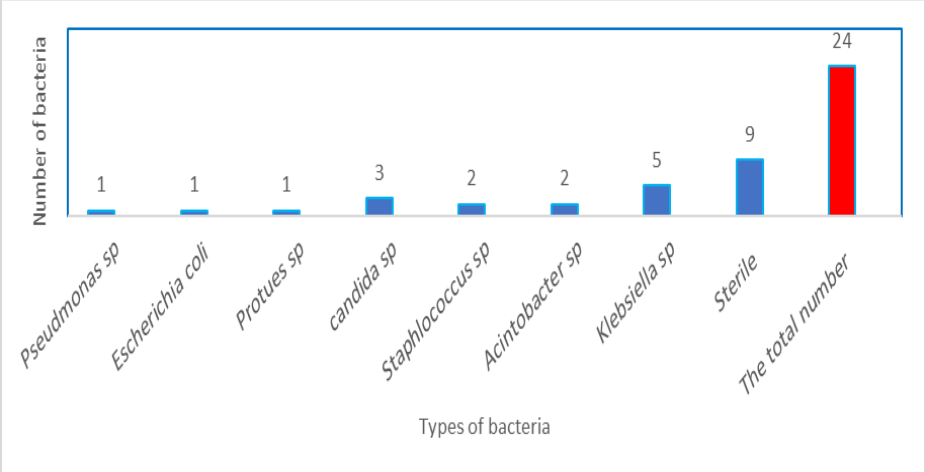
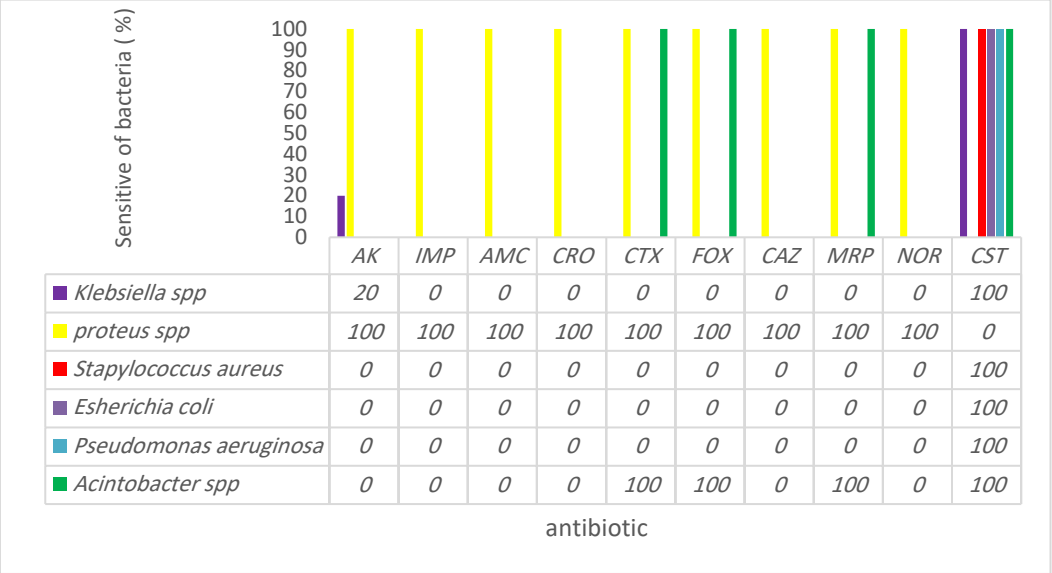


Figure (4): Types of bacteria isolates

proteus spp was sensitive to most antibiotics except (CST), addition to the aforementioned antibiotics were also used to find out their effectiveness on isolated bacteria isolation Acinetobacter spp was sensitive CTX, FOX, MRP and CST. While the rest of the other bacterial isolates are resistant to antibiotics, except CST, it showed effectiveness for all isolates by 100% as figure (5), and this is similar to a study Mehta that in 2020, which showed that bacteria are resistant to the antibiotics used (Mehta, Kumar, Singh, Thakur, & Kumar, 2020).



	AK	IMP	AMC	CRO	CTX	FOX	CAZ	MRP	NOR	CST
Klebsiella spp	20	0	0	0	0	0	0	0	0	100
proteus spp	100	100	100	100	100	100	100	100	100	0
Stapylococcus aureus	0	0	0	0	0	0	0	0	0	100
Esherichia coli	0	0	0	0	0	0	0	0	0	100
Pseudomonas aeruginosa	0	0	0	0	0	0	0	0	0	100
Acintobacter spp	0	0	0	0	100	100	0	100	0	100

Figure (5): Bacterial sensitivity to the antibiotics used.

Conclusion:

It was found that the bacteria showed resistance to all antibiotics except the antibiotic CST. Which showed efficacy on the isolated bacterial species except Proteus spp.

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