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**Original Article**

# Infection in the Post-Caesarean Section Surgical Wound in the Obstetric Gynecology Service

**Katiuska Cecilia Garcia Mariño, Lourdes Margarita Exposito Boue, Luis Antonio Gan Fong, Edith Mercedes Arias Alvarez**

General Teaching Hospital "Dr. Agostinho Neto", Higher Institute of Medical Sciences of Guantanamo, Guantanamo University, Guantánamo, Cuba

## Email address:
kgarciam@infomed.sld.cu (K. C. G. Mariño), lourdesexp@infomed.sld.cu (L. M. E. Boue), lgangfong@gmail.com (L. A. G. Fong), emarias@infomed.sld.cu (E. A. Alvarez)

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**Abstract:** Surgical resolution of obstetric events through cesarean section represents one of the most commonly performed surgical procedures worldwide and at the same time it has contributed to reduce maternal and perinatal mortality. However, it hasincreased the potential risks of the surgical site infections due to the colonization of microorganism. A descriptive and cross-sectional study was conductedin the Gen eral Teaching Hospital "Dr. Agostinho Neto" from June 2016 to June 2017 to characterize from epidemiology and microbiology point of view 38 patients who suffered from surgical site infections after undergoing a caesarean section. Wound swabsfor bacteriology cultures were collected from patients, resulting all of the specimens positive. The variables to be studied were age, risk factors, nature of the surgery, isolated microorganisms and patterns of antimicrobial resistance. The statistical data were analyzed using the Stadistics Program for Social Sciencs version 11.5 and they were summarized with the absolute frequencies and the percentage in two-dimensional tables. Post partum women from 21 to 26 years old who had anemia as a risk factor and who had undergone emergency cesarean sections predominated. The most common isolated microorganisms were *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Klebsiella pneumoniae*, *Escherichia coli*, *Enterobacter*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. A clear multi-resistance to antimicrobials was obtained. It was concluded that modifiable, avoidable and controllable risk factors as well as the identification of bacterium with patterns of multi-resistance to antimicrobials must be under strict and permanent epidemiology and microbiology surveillance.

**Keywords:** Infection, Caesarean Section, Microorganisms, Antimicrobial Resistance

## 1. Introduction

Surgical resolution of obstetric events through cesarean section represents one of the most important advances in contemporary perinatal medicine and it has had an extraordinary impact on reducing maternal and perinatal mortality. However, Surgical Site Infection (SSI) as a result of cesarean section is one of the most common healthcare-associated infections (HAI) worldwide, which has been increasing due to the virulence and pathogenicity of the bacterial strains that increases antimicrobial resistance, as well as the number of patients with more serious pathologies. [1]

Gram-positive microorganisms such as *Staphylococcus aureus*, haemolyticus, and coagulase-negative *staphylococci* and Gram-negative such as *Escherichia coli* are the most common in post-caesarean section infection of the surgical site. [2, 3]

In Cuba, a study conducted from 2004 to 2013 showed the cesarean section caused the 25% of maternal death. [2] Patients who developed a surgical wound infection are 60.0% more likely to be admitted to an intensive care unit, five times more likely to be readmitted to the hospital, and twice as likely

to die as patients without Surgical wound infection. [3]

The World Health Organization (WHO), as well as different international organizations, has shown in recent decades a special interest in the study of women's problems and in the reduction of maternal mortality. [4]

The increasing of Caesarean Section (CS) wound infections was the main reason that encouraged us to develop this research.

The objective of this research was focused on an epidemiology and microbiology study of patients who suffered from infection in the surgical wound post cesarean section in the Gynecology and Obstetrics services of the General Teaching Hospital "Dr. Agostinho Neto", from June 2016 to June 2017.

# 2. Method

A descriptive and cross-sectional study was conductedin Gynecology and Obstetrics servicesof the General Teaching Hospital "Dr. Agostinho Neto" from June 2016 to June 2017.

Wound swabs for bacteriology cultures were collected from 38 patients who suffered from SSI after undergoing a caesarean section, resulting all of samplespositive.

### *2.1. Laboratory Procedures*

1. Sample collection from the surgical wound site.
2. To sow samples in blood agar medium and in sodium thioglycollate medium. Incubation of samples at 37°C.
3. Sample reading after 24 hour of being incubated. In case of negative results, they had to be incubated one more time for 48 hours. The pathogen was identified and the antibiogram was carried out according to the Bauer Kirby method. [5]

### *2.2. Information Collection and Processing Technique*

The statistical data of the database were analyzed using the Stadistics Program for Social Sciencs (SPSS) version 11.5 and they were summarized with the absolute frequencies and the percentage in two-dimensional tables.

# 3. Results

In the present study, it was shown that the age groups most affected by infection in the surgical wound were the patients from 21 to 26 years old (52.6%), followed by those from 15 to 20 years old (26.3%). Among the risk factors, anemia had the highest incidence (47.4%), followed by insufficient weight gain (15.8%) and obesity (7.9%). Emergency surgeries were more frequent (65.8%) than elective ones (34.2%). *Staphylococcus aureus* (50%), *Staphylococcus epidermidis* (18.4%), *Klebsiella pneumoniae* (13.1%), *Escherichia coli* (9.8%), *Enterobacter* (5.2%), *Pseudomonas aeruginosa* and *Acinetobacter baumannii* (2.6%) were the microorganisms isolated a result of sample collection from the surgical wound secretions. All isolated strains were submitted to an antibiogram through the Kirby Bauer method, as a result various patterns of antimicrobial multi-resistance were obtained. (Tables 1, 2 and 3).

***Table 1.*** *Most frequent multi-resistance patterns of Sthaphylococcus.*

| Multi-resistance patterns | *Sthaphylococcus aureus* | | *Staphylococcus epidermidis* | |
|---|---|---|---|---|
| | No. | % | No | % |
| AMX+ OX+FOX+CIP+AZM | 6 | 31.6 | 3 | 42.9 |
| AMX+ AMS+KZ+CAZ+ CN | 7 | 36.8 | 3 | 42.9 |

Source: Register of the Microbiology Laboratory of the General Teaching Hospital Dr. AgostinhoNeto.
Legend: AMX: amoxicillin OX: oxacillin, FOX: cefoxitin, CIP: ciprofloxacin, AZM: azithromycin, AMS: ampicillin + sulbactan, KZ: cefazolin, CAZ: ceftazidime, CN: gentamicin.

***Table 2.*** *Most frequent multi-resistance patterns of non-fermenting bacilli.*

| Multi-resistance patterns | *Pseudomonas aeruginosa* | | *Acinetobacter baumannii* | |
|---|---|---|---|---|
| | No. | % | No | % |
| FEP+CN+CIP+MRP | 1 | 100 | 1 | 100 |

Legend: FEP: cefepime, CN: gentamicin, CIP: ciprofloxacin, MRP: meropenem.

***Table 3.*** *Most frequent multi-resistance patterns of Enterobacteriaceae.*

| Multi-resistance patterns | *Escherichia coli* | | *Klebsiella pneumoniae* | | *Enterobacter* | |
|---|---|---|---|---|---|---|
| | No. | % | No | % | No | % |
| AMX+AMS+KZ+MRP | 2 | 66.7 | 3 | 60.0 | 2 | 100.0 |
| CN+AZM+FEP | 2 | 66.7 | 3 | 60.0 | 1 | 50.0 |

Legend: AMX: amoxicillin AMS: ampicillin + sulbactan, KZ: cefazolin, MRP: meropenem, CN: gentamicin, AZM: azithromycin, FEP: cefepime.

# 4. Discussion

Although the significant advances in the obstetric field, the emergence of new and powerful antibiotics and a comprehensive knowledge on risk factors, puerperal infection is still being one of the main complications in obstetric patients, together with a high incidence of maternal mortality.

Frias Chang [7] and collaborators noticed that a higher frequency of infection belonged to the group of patients from

20 to 29 years old. It is worth to highlight that this group is the most affected one since it includes the highest amount of women exposed to obstetric complications and maternal death due to it is considered a period of highest fertility. Anemia, obesity and clean contaminated urgent surgery were among the main risk factors, mean while *Staphylococcus aureus* and *Escherichia coli* were the most frequent isolated microorganisms.

The presence of anemia and insufficient weight gain suggests that good nutritional status is required to avoid infection. To suffer from anemia before undergoing a caesarian section leads to an alteration of the immune system and to a hyperferremia induced by early iron treatment. At the same time, it saturates the serum transferrin and increases free iron in the blood torrent that is used for bacteria, giving them favorable environment for their development and survival.

Urgent interventions have two times more risk of being infected than elective surgeries. Similarly, contaminated surgical wounds equally increase the risk of infection by 10.0%. [7, 8]

A study carried out in the "Dr. Juan Bruno Zayas" hospital, in Santiago de Cuba, shown that the most common microorganisms isolated from surgical wound samples belonged to the gram-positive group; it was *Staphylococcus aureus* (70.7%). Meanwhile, in the group of gram-negative was *Escherichia coli* (32.1%). It showed that the majority of the cesarean sections are infected by microorganisms acquired by patients during their stay in the hospital (hospital acquired infections) and at the same time those microorganisms developed, in the last 50 years, different mechanisms of antimicrobial resistance.

Published studies show that the *Escherichia coli* and *Staphylococcus aureus,* as causative agents, have the highest incidence of post-caesarean section surgical wound infections. [1]

In the present research, all the microorganisms isolated from the surgical site showed multi-resistance patterns. Multi-resistance take place in bacteria that are resistant to at least one antibiotic from three or more families; this phenomenon constitutes a problem on global scale; that is why, it demands from pharmaceutical industry a great effort in developing new and more powerful antibiotics. [9, 10]

In this research, it is important to highlight the resistance showed by the isolated stump of staphylococci and *Enterobacteria* to amoxicillin, a broad-spectrum beta-lactam antimicrobial from the group of penicillin, which acts on the cell wall of bacteria. However, in last years, this antibiotic has not had a right effectiveness in its action, due to the presence of the beta lactamase enzyme in Gram positive and negative bacteria, so it is recommended to make an antibiogram before using it. [10, 11]

Methicillin-resistant *Staphylococcus aureus* (MRSA) has been one of the most common microorganisms associated with human health; infections by this agent are related to highmortality and economic cost. [12, 13] In the present study, nine *Staphylococcus* strains were found with a multi-resistance pattern that includes cefoxitin, a diagnostic marker for the phenotypic detection of MRSA.

Meropenem is a broad spectrum, highly effective antibiotic for hospital use, with a high degree of stability against the beta lactamase enzyme. It interferes in the synthesis of the bacterial cell wall; however, two strains of non-fermenting bacilli and four of *Enterobacteriaceae* were detected with a resistance pattern that includes Meropenem. It suggests that the bacteria carry the enzyme carbapenemase and at the same time it make them resistant to carbapenems (meropenem and imipenem). It means to be in microbiology and epidemiology alert.

Azithromycin is an antibiotic from the group of macrolides, an inhibitor of protein synthesis in bacteria. It is indicated for Gram positive and negative microorganisms; however these bacteria show resistance against the activity of azithromycin. In the case of *Enterobacteriaceae*, its effectiveness is variable, so it is recommended to carry out susceptibility tests before using it. [11]

Quiñones Pérez D [14] and collaborators state that antimicrobial resistance in bacteria of clinical importance is a growing problem and in recent years it has exceeded the nosocomial barrier to also affect the community.

Bayer AS [15] and collaborators refer that in whole Europe, 41.2% of *Staphylococcus aureus* isolations were resistant to beta-lactams.

On the other hand, some researches carried out by García [16] and collaborators at the Institute of Tropical Medicine “Pedro Kouri”, showed resistance to carbapenems due to impermeability with clear predominance in *Pseudomonas aeruginosa* (87.9%). Impermeability in *Pseudomonas aeruginosa* represents one of the most significant resistance mechanisms against carbapenems. Simultaneously, multi-resistance *Acinetobacter baumannii* strains unveil several resistance mechanisms, mean while nosocomial isolations are most regularly resistant to beta-lactams, including carbapenems, fluoroquinolones, aminoglycosides, tetracyclines, cotrimoxazole, and other antimicrobials. [17]

# 5. Conclusions

It was concluded that modifiable, avoidable and controllable risk factors as well as the identification of etiological agents sush as *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter* spp, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, responsible for the infection post cesarean section surgery, together with the resistance patterns described, demandstrict and permanent epidemiology and microbiology surveillanceof the obstetric gynecological services.

# Conflict of Interests

There is no conflict of interests between the authors.

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