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SURGICAL SITE INFECTIONS: INCIDENCE AND PROFILE OF ANTIMICROBIAL RESISTANCE IN INTENSIVE CARE UNIT

INFECÇÕES DE SÍTIO CIRÚRGICO: INCIDÊNCIA E PERFIL DE RESISTÊNCIA ANTIMICROBIANA EM UNIDADE DE TERAPIA INTENSIVA

LAS INFECCIONES DEL SITIO QUIRÚRGICO: INCIDENCIA Y PERFIL DE RESISTENCIA ANTIMICROBIANA EN LA UNIDAD DE CUIDADOS INTENSIVOS

Jessica Esteves Martins Boaventura[1]
Ana Lúcia Arcanjo Oliveira Cordeiro[2]
Claudia Silva Marinho Antunes Barros[3]
Bárbara Sueli Gomes Moreira[4]
Jessica Oliveira Lobo[5]
Larissa Chaves Pedreira[6]

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Objective: to analyze the incidence of surgical site infections and their profile of microbial resistance in an Intensive Care Unit. Method: this was a cross-sectional, documentary, descriptive study. The study population included 52 patients with surgical site infection in a university hospital in Salvador, Bahia, in the period from 2011 to 2013. Results: age, race/color and number of days in the ICU showed a statistically significant relationship with the outcome. Among the surgeries, the cardiac specialty stood out in number of infections; among the bacteria, gram-negative bacteria (*Enterobacter* and *Escherichia*) grew in cultures of 75.39% of the cases, being more resistant to penicillin; the most frequent outcome was the discharge from the unit. Conclusion: the studies about these infections constitute an important standard for hospital units, which currently face serious risks, especially related to the use and management of antibiotics with impact on the health system.

Descriptors: Intensive Care Units. Infection. Surgical Wound Infection. Drug Resistance Bacterial.

[1] Nurse. Specialist in Intensivist Nursing. Universidade Estadual de Feira de Santana. Salvador, Bahia, Brazil. https://orcid.org/0000-0003-2847-0269
[2] Nurse. PhD in Nursing. Professor at the Universidade Federal da Bahia. Salvador, Bahia, Brazil.
[3] Nurse. PhD in Sciences focused on Biotechnology and Medicine. Professor at theUniversidade Federal da Bahia. Salvador, Bahia, Brazil https://orcid.org/0000-0002-0597-8126
[4] MSc in Nursing. Intensivist Nurse Practitioner, Empresa Brasileira de Serviços Hospitalares. Salvador, Bahia, Brazil. https://orcid.org/0000-0001-8356-6621
[5] Nurse. Intensivist Nurse Practitioner, Secretaria de Saúde da Bahia. Universidade Federal da Bahia. Salvador, Bahia, Brazil. jel_lobo@yahoo.com.br https://orcid.org/0000-0002-7098-2842
[6] Nurse. PhD in Nursing. Professor at theUniversidade Federal da Bahia. Salvador, Bahia, Brazil.

Objetivo: analisar a incidência das infecções de sítio cirúrgico e seu perfil de resistência microbiana em uma Unidade de Terapia Intensiva. Método: trata-se de um estudo transversal, documental, descritivo. Foram incluídos na população de estudo 52 pacientes com infecção de sítio cirúrgico de um hospital universitário de Salvador, Bahia, no período de 2011 a 2013. Resultados: a idade, cor/raça e número de dias em UTI demonstraram relação estatisticamente significante para o desfecho. Dentre as cirurgias, a da especialidade cardíaca destacou-se em número de infecções; dentre as bactérias, as do tipo gram-negativas (Enterobacter e Escherichia) estavam em culturas de 75,39% dos casos, sendo mais resistentes às penicilinas; o desfecho mais frequente foi a alta da unidade. Conclusão: os estudos sobre essas infecções constituem um padrão importante para as unidades hospitalares que, na atualidade, enfrentam sérios riscos, especialmente relacionados ao uso e ao manejo de antibióticos com impacto no sistema de saúde.

Descritores: Unidades de Terapia Intensiva. Infecção. Infecção do Sítio Cirúrgico. Resistência Bacteriana a Antibióticos.

Objetivo: analizar la incidencia de infecciones del sitio quirúrgico y su perfil de resistencia microbiana en una unidad de cuidados intensivos. Método: Este es un estudio transversal, documental, descriptivo. La población del estudio incluyó 52 pacientes con infección del sitio quirúrgico de un hospital universitario en Salvador, Bahía, de 2011 a 2013. Resultados: edad, color/raza y número de días en la UCI mostraron una relación estadísticamente significativa para el resultado. Entre las cirugías, la especialidad cardíaca se destacó en número de infecciones; Entre las bacterias, las bacterias gramnegativas (Enterobacter y Escherichia) se encontraban en cultivos del 75,39% de los casos, siendo más resistentes a las penicilinas; el resultado más frecuente fue el alta de la unidad. Conclusión: Los estudios sobre estas infecciones son un estándar importante para los hospitales que actualmente enfrentan serios riesgos, especialmente relacionados con el uso y manejo de antibióticos con impacto en el sistema de salud.

Descriptores: Unidades de Cuidados Intensivos. Infección. Infección de la Herida Quirúrgica. Farmacorresistencia Bacteriana.

Introduction

Health care-associated infections (HAIs) are part of events related to patient safety at health services in Brazil. Surgical site infections (SSIs) have occupied the third place among the most prevalent HAIs, according to data from the National Health Surveillance Agency (ANVISA), occurring in 14% to 16% of those found in hospitalized patients. SSIs are infections related to surgical procedures, compromising the incision, tissue, organ or space manipulated, with diagnosis in up to 30 days after the surgical procedure or in up to one year in case of prosthetic implantation[1].

The quality of services linked to the question of HAIs, despite current major advances, remains a serious public health problem, in evidence among the leading causes of morbidity and mortality[2]. This fact is confirmed by the impacts caused by SSIs, such as increased length of hospital stay, higher costs with the assistance, as well as the selection and dissemination of multidrug-resistant microorganisms[3]. These result from a genetic mutation after exposure to antimicrobial drugs, a phenomenon that protects them, leading to bacterial multiplication and preventing the treatment and cure of infectious diseases. It is considered a global health problem, which jeopardizes the effectiveness of antibiotics and has occurred throughout the world, for a large amount of microorganisms, with health-threatening increasing prevalence[4]. One of the factors that accelerates and disseminates this resistance is the inappropriate use of antimicrobial agents, which implies the absence of effective treatment for these infections[5].

In the same way that there is heterogeneity of the Brazilian demographic indicators, there are different patterns of antimicrobial resistance and distinct pathogens that cause SSIs, according to the surgery and procedures performed, with *Staphylococcus aureus* as the most prevalent isolated microorganism, followed by *Klebisiella pneumoniae* and *Escherichia coli*[6].

One of the consequences of the increasing antimicrobial resistance is the rational use of antibacterial, which stands as one of the world

concerns. This practice includes the use, with indication and correct selection of antibiotics with fewer adverse effects, most indicated route of administration, monitoring of the use in surgical prophylaxis, appropriate dose, interval between doses, duration of treatment, special characteristics that affect the patient's treatment, such as age, chronic diseases, history of antibiotic therapy and stay in the Intensive Care Unit (ICU)[7-8].

Faced with this problem, this study may contribute to giving greater visibility to the theme in question, which, in spite of the great extension of literature, still has gaps regarding its epidemiological aspects, especially in Brazil. In addition, the results can contribute to broaden the search for patient safety, once it may be threatened by the possible damage caused by HAIs, besides providing changes in treatment of people hospitalized in the ICU and improving professionals' behaviors, aiming to minimize the risks and the occurrence of SSIs. This study also expands the knowledge of health professionals about the need to adopt measures to control and, above all, prevent HAIs, especially the nursing team, responsible for providing 24-hour care for all patients.

Thus, the objective of this study was to analyze the incidence of surgical site infections and their profile of microbial resistance in an Intensive Care Unit.

Method

This is a cross-sectional study, documentary, descriptive, conducted at a university hospital in Salvador (BA), part of the Unified Health System and maintained with funds coming mainly from the Ministry of Education.

This study included all patients with diagnosed SSI, after elective and clean surgery, hospitalized in one of the Intensive Care Units in the period from 2011 to 2013, aged over 18 years and record of diagnostic confirmation provided by the Hospital Infection Control Service (SCIH), that is, those that had defined diagnosis of SSI in the postoperative period and whose treatment occurred during the hospitalization.

The diagnosis of SSI is based on the definition of HAIs and understands the confirmation of infection given by the assistant doctor and the use of surveillance indicators, such as antibiotic therapy, results of tests and cultures, medical and nursing records available in the charts[1]. Considering the aforementioned criteria, there was exclusion of SSIs that occurred in surgeries considered contaminated and those patients who presented infectious process before the surgical procedure, according to the records of the SCIH.

Data collection was carried out in the period from May to December 2014, upon application of a form previously elaborated, containing sociodemographic variables (number of records, age, sex, origin, color/race), clinical variables (medical diagnosis, comorbidities, length of hospital stay), surgical process variables (type of surgery, duration, classification and type of anesthesia), variables of bacteriological research (antibiotic prophylaxis, antibiotic therapy, result of tests, cultures) and outcome (discharge, death or transfer from the hospital). A pre-test of the form was performed, in May 2014, using cases outside the study period, in order to adjust the instrument to available databases and proposed objectives. The databases used were the records of SCIH, Medical Archive and Statistical Service (physical chart), and the Smart system, software that stores electronic medical records.

The collected data were analyzed through the IBM Statistical Package for Social Sciences (SPSS) 22.0 for Windows, and the tabulation and graph-creating program Microsoft® Excel 2019. Initially, a descriptive analysis of the study variables was performed. The categorical variables were presented in tables of absolute and relative frequencies and percentage regarding the occurrence of these findings. For the statistical characterization, mean and standard deviation were calculated, as well as maximum and minimum values, when relevant. For comparison of the variables according to the outcome, the χ^2 test and Fisher's exact test were performed, when appropriate, considering statistically significant differences at 5%.

For presentation and analysis of the use of antibiotics and profile of resistance, the antibiotics were grouped according to the Anatomical Therapeutic Chemical (ATC) classification into five levels adopted by the World Health Organization (WHO). However, for this study, the following levels were considered: 3 (pharmacological subgroup) and 4 (chemical subgroup)[9].

The work plan has met the recommendations of Resolution n. 466 of 12 December 2012, of the National Health Council, which approves the guidelines and regulatory standards for researches involving human beings[10]. The Informed Consent Form (ICF) was not necessary, since the study was retrospective, with collection from documentary databases. The data here analyzed were collected from a research database from a doctoral thesis, in which one of the authors was the responsible researcher, and was approved by the Research Ethics Committee of the Hospital under CAAE 27882314.3.0000.0049 and Opinion n. 573,351.

Results

In the study period, the SSIs of ICU patients occurred in 61.54% (n=32) in males, with predominance in the elderly aged over 60 years (67.31%; n=35), and retirees (44.23%; n=23). There was also a higher proportion of patients coming from the capital (51.90%; n=27), of the *pardo* color/race (61.54; n=32). In general, patients remained hospitalized in the ICU for up to five days with the time of hospitalization statistically significant for death (p=0.003), as well as the *pardo* color/race (p=0.001). There was no correlation of outcome with sex and origin (Table 1).

Table 1 – Distribution of patients hospitalized in the Intensive Care Unit by sex, age group, origin, color/race, time of hospitalization and their relationship with the outcome. Salvador, Bahia, Brazil – 2011-2013 (N=52)

Variable	n	%	p-value (relation)
Sex			0.274
Male	32	61.54	
Female	20	38.46	
Age group			0.034
18 - 30 years	2	3.85	
31 - 45 years	9	17.31	
46 - 59 years	6	11.54	
> 60 years	35	67.31	
Origin			0.207
Capital	27	51.90	
Countryside	25	48.10	
Color/Race			0.001
Pardo	32	61.54	
White	11	21.15	
Black	9	17.31	
ICU Days			0.003
Up to 5 days	22	42.31	
6 - 15 days	17	32.69	
16 - 30 days	8	15.38	
More than 30 days	5	9.62	

Source: Created by the authors.

Considering preexisting comorbidities, 67.31% (n=35) had a diagnosis of systemic arterial hypertension (SAH), 30.77% (n=16) diabetes *mellitus* (DM), 50.00% (n=26) some cardiopathy, 7.69% (n=4) some chronic respiratory disease and 38.46% (n=20) low weight or malnutrition. Regarding the clinical condition, most patients, 48.08% (n=25), received the ASA classification II (American Society of Anesthesiology) physical status classification system (ASA classification system of the physical condition), of the American Society of Anesthesiology. There was no statistically significant relationship between the outcome of death and these clinical conditions.

The occurrence of SSIs in patients admitted to the ICU among medical specialties varied. The cardiac and general surgeries had greater representation, with 33.93% (n=19) and 26.79% (n=15), respectively. Urological surgery had the lowest representation, with 1.79% (n=1). About half of the surgeries had a duration between 2 and 4 hours (51.92%) and in more than half of these procedures, the patients underwent general anesthesia (57.96%). There was no use of surgical antibiotic prophylaxis in 7.69% (n=4). Among those that made use, 83.33% (n=45) employed Cefazolin; 5.56% (n=3), Metronidazole; 3.70% (n=2), Ciprofloxacin; 3.70% (n=2), Cephalothin; and 1.85% (n=1) used Cefoxitin. Five patients received more than one antibiotic for prophylaxis and made use of antibiotic therapy. There was no statistical relationship between mortality and these analyzed variables (Table 2).

Table 2 – Distribution of patients hospitalized in the Intensive Care Unit with Surgical Site Infection according to surgical characteristics, use of antibiotics, outcome and relationship with the outcome. Salvador, Bahia, Brazil – 2011-2013 (N=52) (continued)

Variables	n	%	p-value
Surgical specialty			0.302
Cardiology	19	36.54	
General surgery	14	26.92	
Coloproctology	4	7.69	
Vascular	4	7.69	
Orthopedics	4	7.69	
Head and neck	3	5.77	
Gynecology	3	5.77	
Urology	1	1.92	
Surgical class			0.416
Clean	44	84.62	
Potentially contaminated	8	15.38	
Duration of the surgery			0.091
Up to two hours	3	5.77	
Between 2 and 4 hours	27	51.92	
Between 4 and 6 hours	19	36.54	
More than 6 hours	3	5.77	
Type of anesthesia			0.437
General	30	57.69	
Combined*	13	25.00	
Local**	9	17.31	
Antibiotic prophilaxis			0.671
Yes	48	92.31	
No	4	7.69	
Antibiotic therapy			
Yes	52	100	
No	-	-	

Table 2 – Distribution of patients hospitalized in the Intensive Care Unit with Surgical Site Infection according to surgical characteristics, use of antibiotics, outcome and relationship with the outcome. Salvador, Bahia, Brazil – 2011-2013 (N=52) (conclusion)

Variables	n	%	p-value
Surgical re-approach			0.522
Yes	25	48.08	
No	27	51.92	
Outcome			
Discharge	44	78.57	
Death	9	16.07	
Hospital trasference	3	5.77	

Source: Created by the authors.

Notes:
*Combined anesthesia: General+Epidural (19.24%); General+Blocking (1.92%); General+Subarachnoid (1.92%); General+Epidural+Sedation (1.92%).

** Local anesthesia: Epidural (3.85%), Subarachnoid (11.54%); Blocking (1,92%).

Conventional sign used:
- Numeric data equal to zero not resulting from rounding.

Moreover, 48.08% (n=25) of the patients needed surgical re-approach due to infection. Of these, 60.00% (n=15) needed only one, 16.00% (n=4), two, and 24.00% (n=6), three or more, with a maximum of seven. The outcome of most surgical patients was hospital discharge (78.57%; n=44), but 16.07% (n=9) progressed to death, without statistical relationship with the accomplishment of surgical re-approach.

Among the patients in the study, 73.08% (n=38) had at least one collection for culture test for identification of microorganisms present in the SSI and their profile of resistance and sensitivity. The techniques used for this collection included: puncture of ascetic, abdominal and peritoneal fluid or swab of surgical wound. Of these, 92.11% (n=35) had a positive culture for some pathogen, with higher incidence of gram-negative bacteria (Table 3). Eighteen patients had more than one positive culture of different pathogens. There was no relationship between the outcome and the Gram stain. In addition to identifying the SSI pathogen, culture tests also outline the profile of resistance and sensitivity of this microorganism. In this way, 22.22% (n=48) of isolated pathogens were resistant to at least one antibiotic in the chemical subgroup of penicillin; 15.28% (n=33), in the chemical subgroup of fluoroquinolones; and 11.57% (n=25), in the chemical subgroup of the cephalosporins (Table 3).

Table 3 – Classification of isolated microorganisms, according to Gram stain, chemical subgroup of the prescribed antibiotics and profile of resistance of the microorganisms classified according to the a Anatomical Therapeutic Chemical. Salvador, Bahia, Brazil – 2011-2013 (N=52) (continued)

Variables	n	%	p-value
Gram classification			0.108
Gram negative*	49	75.39	
Gram positive**	16	24.61	

Table 3 – Classification of isolated microorganisms, according to Gram stain, chemical subgroup of the prescribed antibiotics and profile of resistance of the microorganisms classified according to the a Anatomical Therapeutic Chemical. Salvador, Bahia, Brazil – 2011-2013 (N=52) (conclusion)

Variables	n	%	p-value
Prescribed antibiotic chemical subgroup			
Cephalosporins	41	18.64	
Penicillins	37	16.82	
Glycopeptides	34	15.45	
Beta-Lactamase Inhibitors	29	13.18	
Carbapenems	22	10.00	
Fluoroquinolones	21	9.55	
Imidazole derivatives	9	4.09	
Lincosamides	8	3.64	
Aminoglycosides	5	2.27	
Polymyxins	5	2.27	
Antimycotic for systemic use	4	1.82	
Sulfonamides and Trimetroprima combination	3	1.36	
Macrolides	2	0.91	
Resistance profile chemical subgroup			
Penicillins	48	22.22	
Fluoroquinolones	33	15.28	
Cephalosporins	25	11.57	
Sulfonamides and Trimetroprima combination	25	11.57	
Aminoglycosides	24	11.11	
Monobactamics	18	8.33	
Macrolides	15	6.94	
Polymyxins	11	5.09	
Lincosamides	9	4.17	
Carbapenems	5	2.31	
Beta-Lactamase Inhibitors	2	0.93	
Glycopeptides	1	0.46	

Source: Created by the authors.

Notes:
* Gram negative: *Enterobacter* (13.85%); *Escherichia* (12.31%); *Pseudomonas* (10.77%); *Proteus* (9.23%); *Acinetobacter* (9.23%); *Klebisiella* and *Serratia* (6.15% both); *Morganela* (4.62%); *Citrobacter* (3.08%).

** Gram positive: *Staphylococcus* (16.92%); *Enterococcus* (7.69%).

Discussion

SSI is an event that deserves attention, because it represents the most common complication related to the surgery and corresponds to the third highest incidence among the HAIs[1]. In this study, the incidence of SSIs was greater in males, corroborating the national profile. Its mean age is equivalent to that found in a study conducted in Minas Gerais,

in which the population with SSI had a mean age of 58 years[11]. This average age justifies the rate of retirees in the sample (44.23%; n=23).

In addition to the age range, the color/race also showed a significant association with the outcome of the patient (p=0.001). A fact that can be explained by the percentage of 80% of the population of the state of Bahia that self-report as black, according to the National Household Sample Survey (PNAD), of the Brazilian Institute of Geography and Statistics (IBGE)[12].

The evaluation of the time of hospitalization showed higher period than that found in another study in ICU[11], which showed average time of hospitalization of patients with SSI of 6+13.5 days, whereas, in this work, this time was 11.98+13.9 days.

SSI are motivated by factors related to the patient and the surgery. Some risk factors related to the patient are age extremes, smoking, alcoholism, immunosuppression, preexisting infectious focus and comorbidities, such as: Diabetes *Mellitus* (DM), Systemic Arterial Hypertension (SAH), obesity or malnutrition[13]. In this research, the main comorbidity identified was SAH (67.31%), similar to that identified in a study involving 124 patients with SSI, in which 48.39% had SAH, with confirmed diagnosis as the main comorbidities[11].

In addition to the risk factors, some scales can be used to assess the patient's clinical condition, such as the ASA classification, in which the relationship between the score and the risk of clinical impairment are directly proportional. The literature reveals a SSI rate of 6.3% for ASA I, 10.5% for ASA II and 100% for ASA III, proving that the ASA index significantly influences the SSI (p-value<0.0001)[14]. The present study found no association between ASA and outcome.

The factors related to the surgery should also be evaluated, such as the type of anesthesia. In this study, the general anesthesia presented a greater relationship with SSI (57.69%; n=30). There was a variation of surgical specialties in the distribution of SSI, with prevalence of cardiac surgeries (myocardial revascularization, valve replacement; implantation of a pacemaker) and the general surgery (cholecystectomy, splenectomy, gastric surgeries). A university hospital in the Southern region of Brazil indicates average time of surgery of 3 h and 25 min in cases of SSI[15]. A study developed at a public hospital in Belém, Pará, identified higher incidence of SSI in clean surgeries, in comparison with potentially contaminated surgeries, with 10.4% and 3.9%, respectively[14].

Other studies reveal the prophylactic use of antibiotics, which occurred in 92.31% of patients, as a protective factor, when administered up to one hour before incision[11]. This understanding is still controversial among surgeons, because the misuse of antibiotics can increase the rates of infection, generate unnecessary costs and increase bacterial resistance. The clean surgeries have low risk for SSI, in some cases; however, there is indication of prophylaxis, in cases in which the consequences of a SSI can be severe, such as an open heart surgery, craniotomy and valve replacement. Finally, the practice is not uniform, and the use of prophylactic antibiotics is common in the pre-, trans- and post-operative periods.

The selection of a prophylactic antibiotic should consider the probable agent of the SSI, which usually is already part of the endogenous microbiota of the surgical site, cost, toxicity and half-life adequate to maintain the ideal concentration until the closure of the wound[16].

Since the beginning of the use of antibiotics, the level of bacterial resistance has grown progressively. One of the strategies of prevention is the prescription guided by results of culture tests, which allows for the identification of the microorganism causing the infection, profile of sensitivity and resistance. Diagnostic cultures have been shown as the gold standard in the fight against bacterial resistance[17]. Nevertheless, 26.92% (n=14) of the patients in this study were treated empirically without collection for culture tests.

All culture tests of surgical site performed in patients who comprised the study were analyzed, showing a higher incidence of gram-negative bacteria. This result corroborates those found in a research conducted in Bauru, São Paulo, in which 95% of the cultures were positive for gram-negative bacteria[18]. Among the isolated

microorganisms, there was a higher incidence of *Staphylococcus* (16.92%; n=11), *Enterobacter* (13.85%; n=9) and *Escherichia* (12.31%; n=8). This result is consistent with data from a general hospital in Belo Horizonte, in which the main causative organisms of SSI, isolated in cultures, were *Staphyloccocus aureus* (24.3%; n=43) and *Escherichia coli* (15.3%; n=27)[19].

Regarding the evolution of antibiotic resistance of gram-negative bacteria, the genera *Pseudomonas* and *Acinetobacter* stand out, highly dispersive environmental bacteria, which cause significant problems in immunocompromised and critical patients. The resistance of the *Pseudomonas* genus to most ß-lactam agents and fluoroquinolones forced the use of carbapenem agents, which has also led to the spread of the growing resistance to carbapenem agents. In this study, there was antimicrobial resistance of *Staphylococcus aureus* in higher proportion to penicillin (97.6%). Antimicrobial resistance in *Pseudomonas aeruginosa* occurred in greater proportion to piperacillin-tazobactam (84.6%).

SSIs lead to serious consequences, as demonstrated by a study conducted at a university hospital of Londrina, in which 889 patients diagnosed with at least one type of HAIs (38.4%; n=341) evolved to death, with no statistically significant association ($p<0.001$)[2]. In addition to this outcome, there are other repercussions, such as the high financial impact on the health system.

In this way, it is noticeable the importance this health problem should receive, but a study from England observed the lack of general awareness, concern or understanding of patients on SSIs in 41.18% of cases. This datum reveals that the team may have contributed to this situation, by keeping them without information on the SSI or even to minimize its occurrence[20].

Nursing, a profession part of health services and primary responsible for the direct care with the patient and the surgical wound, experiences the ongoing concern with the quality of care. This is reflected in the maturation and growth of professional practice. When directed to the surgical area and intensive care, nursing notes the need for peculiar care with the critical patient under surgical procedure, in order to prevent the occurrence of SSIs. These precautions include the completion of pre-operative bathroom, better glycemic control, with special attention to patients with DM, surgical dressings, controls of environmental factors in the surgery room, among others. In the pursuit of excellence in the quality of care provided to the patient, the planning of actions becomes essential and basilar in nursing practice[21-22].

With this, for the implementation of measures for prevention and control, professionals, especially nurses, must be aware of the risk and protective factors that contribute to the development of infections, seek updating, training, have a vision of organizational culture, skills as educators (for other health professionals and patients and families), team and leadership spirit, flexibility, self-management, ethical bearing and also be communicative. The mastery of knowledge and skills allows for planning and acting in order to reduce HAIs as much as possible or even eliminate them[23-24].

The limitations of this study are related specifically to the quality of hospital records and the physical and organizational difficulties to access the physical records. Furthermore, since this study was carried out at only one hospital service, its results cannot be extrapolated to the region.

Conclusion

The incidence of SSIs in surgical patients admitted to the ICU was 45.61% among the cases that occurred in the hospital during the period from 2011 to 2013. The analysis of the demographic data showed a higher incidence in males, the elderly, black color/race, corroborating the findings available in the literature. Among the risk factors related to the patient, SAH was the main comorbidity related to SSIs. Concerning the surgical factors, there was a greater incidence in patients who underwent cardiac surgery with the use of general anesthesia, and surgical procedure with a duration between 2 and 4 hours.

The results of this study also showed a predominance of gram-negative bacteria in the SSI, with a profile of resistance to the chemical subgroup of penicillins.

The outcome of most patients in the study was discharge from the ICU. Nonetheless, it is important to highlight the negative impact of SSIs, increasing the time of hospitalization, costs and demand with the health care, in addition to the psychological and physical damage.

This study is an important standard for hospital units, which currently face serious risks, especially related to the use and management of antibiotics. Thus, the knowledge about the profile of antimicrobial resistance and the incidence of SSIs directly affects the strategies of guidance for control and treatment of these infections.

Collaborations:

1 – conception, design, analysis and interpretation of data: Jessica Esteves Martins Boaventura, Ana Lúcia Arcanjo Oliveira Cordeiro and Claudia Silva Marinho Antunes Barros;

2 – writing of the article and relevant critical review of the intellectual content: Jessica Esteves Martins Boaventura, Ana Lúcia Arcanjo Oliveira Cordeiro, Claudia Silva Marinho Antunes Barros, Bárbara Sueli Gomes Moreira; Jessica Oliveira Lobo and Larissa Chaves Pedreira;

3 – final approval of the version to be published: Jessica Esteves Martins Boaventura, Ana Lúcia Arcanjo Oliveira Cordeiro, Claudia Silva Marinho Antunes Barros, Bárbara Sueli Gomes Moreira, Jessica Oliveira Lobo and Larissa Chaves Pedreira.

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