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MICROBIOLOGICAL AND CLINICAL PROFILE OF HEALTH CARE INFECTIONS IN A PERNAMBUCO HOSPITAL

Perfil microbiológico e clínico de infecções relacionadas à assistência à saúde em um hospital de pernambuco

Perfil microbiológico y clínico de infecciones de atención médica en un hospital de pernambuco

Juliana Kelly Batista da Silva[1]; Juliana da Rocha Cabral[2]; Edivane Patrícia Galdino Monteiro[3]; Maria Fernanda Franco Domingues Cordeiro[4]; Daniela de Aquino Freire[5]; Regina Celia de Oliveira[6]

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ABSTRACT

Objective: To describe the microbiological and clinical profile of healthcare-related infections (HAI). **Methods:** epidemiological, descriptive and retrospective study. Data from 78 reports of HAI from hospitalized patients between August/2016 to June/2018 were used. Data collection took place between August and December 2018, based on the notification forms and medical records. **Results:** part of the diagnosis of infections was in the neoplasms group 23.0%. Klebsiella pneumoniae tuvo la tasa de infección más alta y fue la más prevalente en pacientes que utilizan dispositivos invasivos. The duration of antibiotic use for more than 10 days was prevalent in association with the diagnosis of primary bloodstream infection. **Conclusion:** studies aiming at preventive measures and rational use of antibiotics are necessary to corroborate a lower prevalence of HAI and bacterial resistance.

Descriptors: Hospital infection, Pathogenicity, Bacterial resistanceto antibiotics.

[1] Nurse. Specialist in Infectology from the University of Pernambuco - UPE. Master's Degree student in Nursing from the Postgraduate Nursing Program of the Federal University of Paraíba-UFPB.
[2] Nurse. Master in Nursing. PhD Student in Nursing at the Associate Nursing Graduate Program of the University of Pernambuco - UPE - and Paraíba State University - UEPB.
[3] Nurse. Master's Degree student in Forensic Studies at the Graduate Program of the School of Dentistry - FOP/UPE.
[4] Nurse. Post-graduate student in Intensive Care - University of Pernambuco - UPE.
[5] Nurse. Master of Nursing. PhD student in Nursing at the Associate Nursing Graduate Program of the University of Pernambuco - UPE - and State University of Paraíba - UEPB.
[6] Nurse. Post-Doctorate in Nursing from the Ribeirão Preto School of Nursing, University of São Paulo - EERP/USP. Lecturer and coordinator of the Associate Graduate Program in Nursing at the University of Pernambuco - UPE.

RESUMO

Objetivo: Descrever o perfil microbiológico e clínico de infecções relacionadas à assistência à saúde (IRAS). **Métodos:** estudo epidemiológico, descritivo e retrospectivo. Utilizou-se dados de 78 notificações de IRAS de pacientes internados entre agosto/2016 a junho/2018**.** A coleta de dados ocorreu entre agosto a dezembro de 2018, a partir das fichas de notificações e registro de prontuários. **Resultados:** parte dos diagnósticos de infecções foi no grupo neoplasias 23,0%. Klebsiella pneumoniae obteve maior taxa de infecção, e foi a mais prevalente nos pacientes em uso de dispositivos invasivos. O tempo de uso de antibióticos por mais de 10 dias foi prevalente na associação com o diagnóstico de infecção primária de corrente sanguínea. **Conclusão:** são necessários estudos que visem medidas preventivas e o uso racional de antibióticos para corroborar com uma menor prevalência de IRAS e resistência bacteriana.

Descritores: Infecção hospitalar, Patogenicidade, Resistência bacteriana a antibióticos.

RESUMEN

Objetivo: Describir el perfil microbiológico y clínico de las infecciones relacionadas con la salud (HAI). **Métodos:** estudio epidemiológico, descriptivo y retrospectivo. Se utilizaron datos de 78 informes de IAH de pacientes hospitalizados entre agosto/2016 a junio/2018. La recopilación de datos tuvo lugar entre agosto y diciembre de 2018, según los formularios de notificación y los registros médicos. **Resultados:** parte del diagnóstico de infecciones fue en el grupo de neoplasias 23.0%. Klebsiella pneumoniae tuvo una tasa de infección más alta en el período de hospitalización de más de 10 días y fue la más prevalente en pacientes que utilizan dispositivos invasivos. La duración del uso de antibióticos durante más de 10 días fue frecuente en asociación con el diagnóstico de infección primaria del torrente sanguíneo. **Conclusión:** los estudios que apuntan a medidas preventivas y al uso racional de antibióticos son necesarios para corroborar una menor prevalencia de HAI y resistencia bacteriana.

Descriptores: Infección hospitalaria, Patogenicidad, Resistencia bacteriana a antibióticos.

INTRODUCTION

Healthcare-related infections (HAIs) are considered adverse events (AEs) in the health care services. They are defined as infection that is acquired after patient admission and manifests itself after admission or discharge when it can be related to hospital admission or procedures.[1] This is not only a biological/pathological event, but also a historical and social one, which has repercussions on health care safety, and is one of the world's major challenges for the quality of health care.[2]

The World Health Organization (WHO) estimates that 1.4 million infections occur at any one time in both developed and developing countries. In the United States, it is estimated that about two million HAIs occur annually, resulting in 60 to 90 thousand deaths at a cost of approximately 17 to 29 billion dollars.[3]

It is understood that infections lead to increased hospital financial costs as well as increased length of stay and morbidity and mortality of patients in the country's health services. Prevention measures and knowledge about these infections are important allies for HAIs prevention.[4]

Literature reports that 10.1% of the patients admitted to hospital and 35.2% of the patients in Intensive Care Units (ICU), in developing countries, develop HAIs as a result of health care.[5]

In view of the scenario, it is necessary to draw up the microbiological and clinical profile of the HAIs so that data are collected that subsidize and quantify studies, in order to assure the patient a safe and quality hospitalization. Identify risk factors and establish interventions, such as adequacy of antimicrobial treatment for the etiological agent isolated according to the profile of the institution, aims to reduce incidence and prevalence of mortality from HAIs and reduce the interval of hospitalization aiming at pertinent outcomes.[6]

It is urgent to say that knowing the microbiological and clinical profile of the HAIs of a health institution becomes essential, as it favors the construction of a relevant database in order to be a source of alert and information for health professionals and entities interested in data regarding patient safety.

Following this context, the objective of the present study is to describe the microbiological and clinical profile of healthcare-related infections in inpatients at a University Hospital in Recife, Pernambuco.

METHODS

Epidemiological, descriptive, cross-sectional and retrospective study, whose sample consisted of notification sheets from the Hospital Infection Control Commission (HICC) and medical records of adult patients diagnosed with ARDS, according to criteria of the National Health Surveillance Agency (Anvisa),[7] admitted to the University Hospital, from August 2016 to June 2018.

Data collection took place from August to December 2018 from the notification forms and charts. Patients aged 18 years or older, of both genders with positive cultures for etiological agents sensitive to antimicrobials or resistant multidrug agents, from tests of cultures collected from patients admitted to the hospital under study, and analyzed by the laboratory linked to the institution, which forwards the reports (topography) to HICC, containing a profile of resistance and sensitivity to antibiotics of use, were part of the study. Those with less than 48 hours of hospitalization and incomplete data were excluded. Thus, after analysis of 138 reports and records, 78 were eligible, according to established criteria.

The sample was of the non-probabilistic type, for convenience defined from the expected time of data collection. A form was used for the socio-demographic and clinical data. The investigative questionnaire was composed of variables related to the admission diagnosis; length of stay; gender and age; sectors of stay; patient

outcome; sites of infection and biological sample; type of HAIs; submission to invasive procedures; ICU admission; previous use of antibiotics; risk factors and comorbidities associated to basic pathologies.

The design of the collection followed the identification of the register of eligible patients for the study, obtaining the microbiological and clinical profile, according to information provided by data processed by HICC and information from medical records.

The data was stored in a structured database in Microsoft Office Excel®- 2010 of Windows; and then transferred to the Statistical Package for Social Sciences® (SPSS) version 20.2 for processing.

The categorical variables were analyzed in simple and relative frequency form and presented in tables.

The study was prepared in accordance with Resolution 466/2012 of the National Committee on Ethics in Research, and was submitted to the Research Ethics Committee of the Hospital Complex of the University of Pernambuco and approved on June 18, 2018, by the opinion: 2,710,117.

RESULTS

Of these, the predominance was for males 40 (51.3%). The prevailing age range was between 18 and 60 years (40 - 51.3%). The diagnoses on admission were mostly of pathologies of the group neoplasms 19 (24.3%), followed by the group of people living with HIV 17 (21.8%).

Regarding the length of hospitalization, the data show the time interval from 10 to 30 days of hospitalization with the highest prevalence in the sample 24 (30.8%). 51 (65.4%) died as clinical outcome. To the touching sector of hospitalization, 63 (80.5%) were interns in ICU's.

Table 1 presents descriptive statistics of positive crop results for etiological agents and infection sites. Some infections, according to clinical data recorded, were diagnosed simultaneously in the same patient during hospitalization, justifying the junction of samples and diagnosis in some paragraphs of the table.

Table 1 - Samples of positive cultures and sites of healthcare-related infections. Recife, PE, Brazil, 2018

Variables	n (%)
Sample	
Blood	37 (47,4)
Tracheal Secretion	14 (17,9)
Urine	11 (14,1)
Wound Culture	1 (1,3)
Biliary Liquid	2 (2,6)
Pleural Fluid	3 (3,8)
Blood/Biliary Liquid	1 (1,3)
Blood/Catheter tip	1 (1,3)
Blood/Tracheal Secretion	4 (5,1)
Blood/Urine	3 (3,8)
Blood/Urine/Tracheal Secretion	1 (1,4)
Infection	
Ignored	2 (2,6)
PBIs	37 (47,4)
PBIs/UTI	2 (2,6)
SSI	7 (9,0)
UTI	10 (12,8)
UTI/PBIs	2 (2,6)
MVP	17 (21,7)
MVP/PBIs	1(1,3)

***PBIs:** Primary Bloodstream Infection/ **SSI:** Surgical Site Infection/ **UTI:** Urinary Tract Infection/ **MVP:** Mechanical Ventilation Associated Pneumonia.
Source: Research Data, 2018.

Table 2 shows the isolated etiological agents in positive culture samples according to the time of diagnosis of infection. Klebsiella Pneumoniae 25 (32%) and Acinetobacter Baumanni 15 (19.2%) prevailed as the most isolated etiological agents in cultures, as shown in.

Table 2 - Isolated etiological agents in positive culture samples. Recife, PE, Brazil, 2018

Isolated	n (%)
Acinetobacter Baumannii	15 (19,2)
Candida Albicans	5 (6,4)
Enterococcus Faecalis	3 (3,8)
Escherichia Coli	2 (2,6)
Klebsiella Pneumoniae	25 (32)
Kodamae Ohmeri	1 (1,3)
Proteus Mirabilis, Serratia Marcescens	1 (1,3)
Providencia Rettgeri	1 (1,3)
Pseudomonas Aeruginosa	12 (15,4)
Salmonella Entérica	2 (2,6)
Serratia marcescens	1 (1,3)
Staphylococcus Aureus	10 (12,8)

Source: Research Data, 2018.

Regarding the use of invasive devices, used by patients with positive cultures, it is observed that Klebsiella Pneumoniae had a high percentage in relation to the other etiological agents shown in Table 3. It is noted that patients with bladder catheter delay 18 (75.0%), central venous catheter 20 (83.3%), peripheral venous access nine (37.5%) and mechanical ventilation 20 (83.3%) showed positive cultures for Klebsiella Pneumoniae.

Table 3 - Use of invasive devices in IRAS carriers, according to the main etiological agents isolated in positive culture samples. Recife, PE, Brazil, 2018

Variables		Acinetobacter Baumanni	Klebsiella Pneumoniae	Pseudomonas Aeruginosa	Staphylococcus Aureus
		n (%)	n (%)	n (%)	n (%)
UIC*	Yes	11 (78,6)	18 (75,0)	6 (75,0)	5 (100,0)
	No	3 (21,4)	6 (25,0)	2 (25,0)	0 (0,0)
CLV*	Yes	13 (92,9)	20 (83,3)	6 (75,0)	4 (80,0)
	No	1 (7,1)	4 (16,7)	2 (25,0)	1 (20,0)
PVA*	Yes	5 (35,7)	9 (37,5)	2 (25,0)	2 (40,0)
	No	9 (64,3)	15 (62,5)	6 (75,0)	3 (60,0)
MV*	Yes	14 (100,0	20 (83,3)	8 (100,0)	5 (100,0)
	No	0 (0,0)	4 (16,7)	0 (0,0)	0 (0,0)

IUC: Indwelling urinary catheter/**CLV:**Central Venous Line/**PVA:**Peripheal Venous Access/ **MV:**Mechanical Ventilation.
Source: Research Data, 2018

Table 4 describes the risk factors prior to the isolate in the topography of the cultures, associated with HAIs. Previous hospitalizations were not correlated with infections in this study. The time of antibiotic use for more than 10 days was prevalent in association with the diagnosis of PBIs 12 (42.9%). The previous antibiotics used were mostly used prior to the isolate in culture, of the antimicrobial Piperacillin/Tazobactam mainly in relation to PBIs seven (25.0%) and MVP five (29.5%).

Table 4 - Risk factors, according to HAIs. Recife, PE, Brazil, 2018

Variables		PBIs*	SSI*	UTI*	MVP*
		n (%)	n (%)	n (%)	n (%)
Previous admissions	Ignored	1 (3,6)	0 (0,0)	0 (0,0)	1 (5,9)
	Yes	6 (21,4)	2 (28,6)	1 (12,5)	1 (5,9)
	No	21 (75,0)	5 (71,4)	7 (87,5)	15 (88,2)
Time of antibiotic use	Ignored	9 (32,1)	1 (14,2)	1 (12,5)	4 (23,5)
	<10 days	7 (25,0)	3 (42,9)	2 (25,0)	9 (53,0)
	> 10 days	12 (42,9)	3 (42,9)	5 (62,5)	4 (23,5)
Previously used antibiotics	Didn't perform	9 (32,1)	2 (28,6)	1 (12,5)	4 (23,5)
	Amicacin	0 (0,0)	1 (14,3)	0 (0,0)	0 (0,0)
	Sulfamethoxazole + trimethoprim	0 (0,0)	0 (0,0)	0 (0,0)	2 (11,7)
	Cefepime	2 (7,1)	0 (0,0)	0 (0,0)	0 (0,0)
	Ceftriaxone	6 (21,5)	0 (0,0)	5 (62,5)	3 (17,6)

Meropenen	1 (3,6)	1 (14,3)	0 (0,0)	0 (0,0)
Metronidazol	0 (0,0)	0 (0,0)	0 (0,0)	1 (5,9)
Piperacyline/tazobactam	7 (25,0)	3 (42,8)	1 (12,5)	5 (29,5)
Ampicilina/Sulbactam	1 (3,6)	0 (0,0)	0 (0,0)	1 (5,9)
Vancomycin	2 (7,1)	0 (0,0)	1 (12,5)	1 (5,9)

***PBI:** Primary Bloodstream Infection/ **SSI: Surgical Site Infection/ UTI:** Urinary Tract Infection/ **MVP:** Pneumonia Associated with Mechanical Ventilation.
Source: Research Data, 2018.

DISCUSSION

The results revealed that the HAIs commonly obtain a predominance of males ratifying with the literature. It is also evident that the age group prevalent in the study is inserted in the sociodemographic data evidenced by other researches.[8-9]

As far as clinical characteristics are concerned, it is noticeable that besides the factors inherent to health services and professionals, there are those related to the patients' own underlying disease. Neoplastic diseases, especially hematological diseases, lead to a decrease in the immune response, especially with respect to neutropenia, which is commonly evidenced in cancer patients, facts that associated favor the occurrence of bacterial or fungal infections.[10]

Considering HIV, there are perceived risks secondary to this diagnosis for predisposition to infection. It is noted that patients with lower TCD4 lymphocyte counts are at higher risk of developing infections.[11]

The length of stay in the range of 30 to 45 days is commonly linked to infections. However, there is evidence showing that there is no significant difference in the length of stay between patients.[6]

The correlation of HAIs with ICU admission was expressive for all the characteristics that the ICU reflects in the internment. This fact can be justified by the indiscriminate use of antimicrobials in this environment, besides presenting intense invasive procedures, aspects that characterize a favorable environment for the spread of HAIs.[12]

A study that evaluated mortality and risks associated with HAIs in a university hospital showed that all ICUs of the institution had a higher prevalence of infection when compared to the wards and emergency room. Consequently, a higher percentage of mortality in patients with HAIs in these units was also evidenced.[12]

Although blood culture samples were prevalent for infected positive cultures in the research, a study carried out in Neurological and Geralde ICU, obtained a greater amount of positive cultures for respiratory topography (25%), followed by urine (21.2%), blood (10.6%) and other secretions (21.3%).[13]

Corroborating the most evident sample in this study, the most prevalent diagnosis of HALs was PBIs. The main causes occur mainly due to microorganisms in the skin of the patient, the health team and contamination of the venous catheter center.[14]

The profile found of positive cultures in this study corroborates data obtained in a retrospective observational study, which showed high levels of cultures related to non-fermentative Gram-negative bacteria, with Klebsiella pneumonia and other Enterobacteria being more prevalent.[15]

Gram-negative bacteria, especially Klebsiella pneumoniae, are noticeably evidenced in several studies, corroborating the profile found.[16-18] Moreover, this bacterium shows high correlation with mortality rates.

The use of invasive devices is considered a risk factor for infections. Although the prevalence of the use of peripheral venous access with positive cultures did not present significant, studies reveal that the use of peripheral intravenous lines was the most used device in the association of the prevalence with HAIs, followed by mechanical ventilation and central venous catheter. The study also showed that the chances of acquiring HAIs are, respectively, 7.89, 7.84, 6.67 and 6.63 times more when exposed to urinary catheter, drains and tubes, central and peripheral catheters, respectively.[19]

Although the present study shows a relationship of Klebsiella pneumoniae in all invasive devices and infections, the literature has shown that the most prevalent microorganism, causing the highest number of infections, was Escherichia coli. Enterococcus sp was the second most prevalent microorganism, followed by Pseudomonas aeruginosa.[20]

The relationship with previous hospitalizations was of low prevalence, which corroborates with the literature.[21] On the other hand, the time of antimicrobial use was significant for use longer than ten days. However, groups presented significantly lower mortality when receiving antibiotic treatment for less than seven days.[22]

In view of the above and considering the high rates of HAIs, as well as the complexity and seriousness, the implementation of prevention strategies and efforts aimed at improving the quality of care becomes urgent. Therefore, in order to achieve the reduction of hospital infections and, consequently, the deaths related to them, it is necessary to monitor the cases for better antimicrobial treatment, disclose data to professionals involved in the institutional work process, identify patients at risk, and strictly control the care procedures.[23]

CONCLUSIONS

The prevalence of the microbiological profile of patients hospitalized with HAIs was composed of the agents Klebsiella pneumoniae and Acinetobacter baumannii. These were also associated with positive cultures for all sites of infection. The clinical outcome obtained in greater numbers was death.

The limitations of the study were related to lack of records in the hospital records that caused loss of data and samples. It is noted that in-depth studies on nutritional risk and HAIs are necessary in order to obtain greater attention

from the clinical nutrition team to clinical records.

Studies aimed at preventive measures and rational use of antibiotics should be emphasized to corroborate a lower prevalence of HAIs and bacterial resistance.

It is reinforced that health care professionals should aim to establish criteria and value safe hospitalization, according to the knowledge of microbiological and clinical profile of HAIs. Avoiding this adverse event is essential to reduce the incidence and prevalence of mortality due to HAIs, as well as the interval of hospitalization aiming at better clinical outcomes.

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***Corresponding Author:**
Juliana Kelly Batista da Silva
R. Dr. Otávio Coutinho
Santo Amaro, Recife, PE, Brasil
E-mail address: juliana_kelly19@hotmail.com
Telephone number: (81) 3183-3606
Zip Code: 52.171-011

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