INFECTIONS ASSOCIATED WITH HOSPITALIZATION OVER ONE YEAR PERIOD

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ABSTRACT

The aim of this study was to identify the bacterial species circulating in various wards of the Emergency Clinical Hospital Constanta, involved in infections associated with hospitalization. Clinical specimens were obtained during 2016 year period. Identification of species and sensitivity tests were performed on VITEK 2 System. There were isolated 163 bacterial strains suspected to be responsible for infections associated with hospitalization. Surgery wards had the most important number of cases, 49% of all. The second most affected ward was neonatology (11%), as many as gynecology (5%) and pediatrics (6 %) together. According to the site of the infection, digestive are majoritary (42.94%), followed by surgical wounds (16.56%) and respiratory infections (15.33%). Septicemia cases (11.04%) are important due to the severity.

Distribution on months varies between a minimum number of cases in January (5) and a maximum of cases in April (19). Gram-negative bacilli were the most frequently involved (49%). The most frequent species was *Acinetobacter baumannii* (28 cases), followed by *Pseudomonas aeruginosa* (15) and *E.coli* (7). Anaerobic bacteria (*Clostridium difficile*) are the second most important group (32% of the cases), followed by Gram positive cocci (15%) mostly staphylococci. Multidrug resistance was diagnosed in most *Acinetobacter baumannii* strains. A special attention must be given to associations of bacteria, that even though are in small number (2% of the cases), are more difficult to be treated.

Keywords: hospitalization associated infections

Introduction

The aim of this study was to realize an updated map of the bacterial species circulating in various wards of the Emergency Clinical Hospital Constanta, involved in infections associated with hospitalization.

Materials and methods

Clinical specimens were obtained during 2016 year period. Identification of species and sensitivity tests were performed on VITEK 2 System.

Positive selection of case was based on clinical data and availability of laboratory results. The healthcare-associated infections

identified and presented in study were urinary tract infections, genital infections, surgical site infections, digestive infections, pneumonia, bloodstream infections and neonatal sepsis, healthcare-associated *Clostridium difficile* infections, and other infections, according to literature reviews, the European Union case definitions. (1,2)

Results and discussions

During one-year period (2016) there were isolated 163 bacterial strains suspected to be responsible for infections associated with hospitalization.

According to the hospital ward where bacterial strains were isolated, 79 were from surgery, 18 from neo-nathology, 10 from paediatrics, 8 from obstetrics-gynaecology and 48 from other departments. It can be noticed that surgery wards had the most important number of cases, 49% of all. The second most affected ward was neonatology (11%), as many as gynecology (5%) and pediatrics (6 %) together (Figure 1).

Figure 1. Distribution of cases upon hospital wards where bacteria were isolated

Depending on the location of the infection, we found: Septicaemia - 18 cases, respiratory tract infections - 25 cases, digestive infections - 70 cases, surgical infections - 27 cases, urinary infections - 13 cases, skin infections - 3 cases, genital infections - 1 case, infections after intra-muscular treatment - 2 cases, other infections - 4 cases (Figure 2).

Figure 2. Distribution of cases according to the site of the infection

Analysing these data, it is noted that the digestive infections are majority (42.94%), followed by surgical wounds (16.56%) and respiratory infections (15.33%). Septicemia cases come next (11.04%), being important due to the severity of the diagnosis.

Distribution on months shows that, as expected, the minimum of nosocomial cases were in winter months, January and December. From January, there was an constant increase in the number of cases, till April, where they reached a peak of 19 cases. Then, we can notice a slight decrease till august (15 cases), further an abrupt decrease in September, reaching a low of 9 cases, than again an abrupt increase to a second high of 16 cases, in October. From October, the number of cases decreased constantly to 7 cases in December (Figure 3).

Figure 3. Distribution of cases over the months in one year (2016)

The bacterial species isolated in nosocomial infection in 2016 year were:

Gram-negative bacilli

- *Acinetobacter baumannii* – 28 strains
- *Pseudomonas aeruginosa* – 15 strains
- *Enterobacter cloacae* – 4 strains
- *E.coli* – 7 strains
- *Klebsiella pneumoniae* – 6 strains

Gram –positive cocci

- *Streptococcus salivarius* – 4 strains
- *Enterococcus spp* – 5 strains
- *Staphylococcus aureus* – 5 strains
- *Staphylococcus apidermidis* – 4 strains

Gram-positive bacilli

- *Corynebacterium jeykum* – 2 strains

Anaerobic bacteria

- *Clostridium difficile* - 40

Associations of species:

- *Acinetobacter baumannii*+ *Pseudomonas aeruginosa* - 2
- *Acinetobacter baumannii*+ *Enterococcus* – 1

Gram-negative bacilli were the most frequent group involved in infections associated with hospitalization (49% of the cases). Anaerobic bacteria, precisely *Clostridium difficile* are the second most important group (32% of the cases), followed by Gram positive cocci (15%), mostly staphylococci. In a small number of cases, gram-positive bacilli produced infections associated with hospitalization. A special attention must be given to associations of bacteria, that even though are in small number (2% of the cases), are more difficult to be treated (Figure 4).

According to the Carmin-Rom Report, MRSA accounted for 60.4% of all reported *Staphylococcus aureus* strains in 2015; for the fourth consecutive year in Romania, the highest level of MRSA among European states participating in EARS Net is recorded and 3.5 times higher than the weighted average for these states. An emerging problem with antibiotic resistance of Gram-positive cages is the resistance to glycopeptides of *Enterococcus faecium* (VRE); in the period 2011-2015 it rose from 0% to 32.4%, $R^2 = 0.94$, which is the second level after Ireland communicated.

For Gram-negative bacilli frequently involved in medical-related infections, extensive resistance (including carbapenems) remains extremely common: for *Pseudomonas aeruginosa*

62.6% carbapenem resistance and 57% bacterial multidrug resistance, for *Acinetobacter baumannii* the carbapenem resistance was 82.1%, and for *Klebsiella pneumoniae* isolates, resistance to carbapenems increased in five years from 0% to 35.8%.

The multi-drug resistance of the major Enterobacteriaceae (*Escherichia coli* and *Klebsiella pneumoniae*) was maintained at high levels: 10.4% and 46.1%, respectively (3-5, 7, 8).

At national level, infections associated with medical care remain a very underestimated pathology in Romania, with an average incidence of 0.33% of dispensed patients, based on the statistical reports of the majority of hospitals in Romania. Since August 2014, a *Clostridium difficile* (ICD) infection surveillance system has been implemented at national level which has led to an increase in the reporting of nosocomial infections. The trend to under-report also persists in this surveillance system, and the hospitals also reported a very low number of relapses (4.9%) and severe cases (6.7%) (6).

In our study, most hospital *Staphylococcus aureus* were resistant to carbapenems. For Gram negative bacilli, the results are very different among species of the Enterobacteriaceae family. *E. coli* was sensitive to carbapenems, no case of resistance found. On the contrary, there were found 4 strains resistant to cyclines.

For *Klebsiella* species, the situation was different. *Klebsiella* is often resistant to imipenem and meropenem, but sensitive to tetracycline and tigecycline. A number of 3 cases were multi-drug resistant. The majority of *Acinetobacter baumannii* strains (25 out of 28) were multidrug resistant.

Conclusions

During one year period (2016), in the hospital were isolated 163 bacterial strains considered responsible for infections associated with hospitalization.

Surgery wards had the most important number of infections associated with medical assistance, 49% of all cases. The second most affected ward was neonatology (11% of the cases), as much as than Gynecology (5%) and pediatrics (6%) together.

According to the site of the infection,

digestive infection were majoritarian (42.94%), followed by surgical wounds (16.56%) and respiratory infections (16.33%) Septicemia cases were less (11.04%), but this number can be considered important due to the severity of the diagnosis.

Distribution on months varies between a minimum number of cases in January (5) and a maximum of cases in April (19 cases).

Gram negative bacilli were the most frequent group involved in nosocomial infections (49% of the cases). Anaerobic bacteria (*Clostridium difficile*) are the second most important group (32% of the cases), followed by Gram positive cocci (15%).

A special attention must be given to associations of bacteria, that even though are in small number (2% of the cases), are more difficult to be treated.

Multidrug resistance was diagnosed in most *Acinetobacter baumannii* strains.

The role of the microbiology laboratory in survey and prevention of nosocomial infections is very important and refers to the appropriate diagnosis and good communication with the clinicians in the hospital wards.

References

1. Cassini A, Plachouras D, Eckmanns T, Abu Sin M, Blank HP, Ducomble T, et al. Burden of Six Healthcare-Associated Infections on European Population Health: Estimating Incidence-Based Disability-Adjusted Life Years through a Population Prevalence-Based Modelling Study. *PLoS Med.* 2016;13(10):e1002150.
2. European Centre for Disease prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals—protocol version 4.3. Stockholm: ECDC; 2012. Retrieved from: <https://ecdc.europa.eu/en/publications-data/point-prevalence-survey-healthcare-associated-infections-and-antimicrobial-use>.
3. Popescu GA, Șerban R, Pistol A. Consumul de antibiotice, Rezistența microbiană și Infecții Nosocomiale în România - 2014 . București, 2016
4. WHO. Health care-associated infections FACT SHEET.
5. Point Prevalence Survey: Healthcare-associated infections and antimicrobial resistance in European hospitals., 2013
6. Popescu, G. A., Șerban, R., Niculcea, A. - CARMIN-ROM 2015 Consumul de antibiotice, Rezistența microbiană și Infecții Nosocomiale în România – 2015;
7. Organization WH. Health care-associated infections Fact Sheet [www.who.int: WHO;](http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf) (cited 2018. Available from: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf.
8. European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals. Stockholm: ECDC; 2013. Retrieved from: <https://ecdc.europa.eu/en/publications-data/point-prevalence-survey-healthcare-associated-infections-and-antimicrobial-use-0>