THE INFECTION WITH CLOSTRIDIUM DIFFICILE IN HOSPITALS: RESULTS AFTER FIVE MONTHS OF SURVEILLANCE

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Abstract: *This study presents the first results after the implementation of a surveillance programme for the infections with Clostridium difficile (ICD), starting with February 2014, once with the etiological investigation of this pathology in an emergency county hospital; the aim of the study was to evaluate the incidence of ICD in the discharged patients; the level of incidence of the positive cases of 0.85/1000 patients-days was comparable or even higher than the results from the previous studies conducted in hospitals from European or North American countries that have active surveillance systems for this type of infection.*

Cuvinte cheie: *Clostridium difficile, antibioterapie, program de supraveghere, incidenţă*

Rezumat: *Studiul de faţă prezintă primele rezultate după implementarea unui program de supraveghere a infecţiilor produse de Clostridium difficile (ICD), începând cu luna februarie 2014, odată cu demararea investigării etiologice a acestei patologii într-un spital judeţean de urgenţă; scopul studiului a fost aprecierea incidenţei cazurilor de ICD externate din spital; nivelul incidenţei cazurilor pozitive de 0,85/1000 pacienţi-zile a fost comparabil sau chiar mai mare faţă de rezultatele din studii anterioare efectuate în spitale din ţări europene sau nord-americane, care au sisteme de supraveghere activă a acestui tip de infecţie.*

INTRODUCTION

Clostridium difficile is an anaerobic gram-positive bacillus associated for the first time with the disease in 1978, when it was identified as the causative agent of the pseudo-membranous colitis;(1) this bacillus is the most common etiologic agent of nosocomial infections caused by the anaerobic bacteria and is also one of the leading causes of the diarrheal syndromes acquired in the hospitals. The clinical manifestations of the infection with Clostridium difficile (ICD) are ranging, from asymptomatic state to diarrhoea, pseudo-membranous colitis or toxic mega-colon. Nosocomial ICD (ICDn) can be the direct or indirect cause of death at a rate of 0.6-1.5% of patients (2,3), and the estimated additional costs amounts are of 3669-7234 U.S. dollars / hospitalized patient.(4,5) To have a clear overview of the epidemiological situation in our country, the introduction of ICD diagnosis and surveillance in hospital units is a necessary first step in order to know the incidence of this phenomenon health and especially for the implementation of the control programmes necessary for mastering the risk infectious.

PURPOSE

We aimed at determining the incidence of ICD in a hospital for adults, distinguishing the incidence of the nosocomial and import cases.

METHODS

ICD surveillance was conducted taking into account the criteria contained in the hospital protocol, which provides data to be recorded for all the wards of the hospital, exclusively for the patients with permanent hospitalization. According to the surveillance protocol, all the cases compatible with ICD were investigated in the laboratory using immune-chromatographic rapid tests for the qualitative detection of the toxins A and B of the bacteria. In this study we grouped the hospital wards into three: the surgical departments, the internal (medical) departments and the intensive care departments. The study presents the results of five months of surveillance, since 01.02.2014. ICD was defined as one of the following: diarrhoea / ileums / toxic mega-colon and detection of the C. difficile in the stools; or pseudo-membranous colitis diagnosed at the endoscopy. The case definitions were used to distinguish between the nosocomial infections and the ones contracted outside the hospital (import cases), based on the temporal association between the onset of the ICD and the date of hospitalization and discharge of the patient: the nosocomial ICD were those with the onset in the hospital after at least 48 hours from the hospitalization or with onset in the hospital within 48 hours of hospitalization in a patient who was discharged from the hospital in less than four weeks ago, or with onset at home within 4 weeks after the discharge from the hospital (figure no. 1).

Figure no. 1. Intervals which mark the limit between the nosocomial and ICD cases (according to ECDC recommendations) (6)

The studied patients. To calculate ICD incidence during the studied period, we related the positive cases at the number of patients at risk, namely those discharged from the hospital wards during that interval (excluding the population of

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newborns from the hospital maternity). To determine the incidence density, we used in the denominator the total number of the days of the hospitalization, namely the sum of all the days spent by all the patients in the hospital during that time. Population at risk and the total days of the hospitalization were analyzed both for the entire hospital, and separately, for the surgical departments, internal and ICU. These data were obtained from the statistical service of the hospital. To achieve the database, of the statistical and graphics processing, we used Excel and MedCalc software.

RESULTS

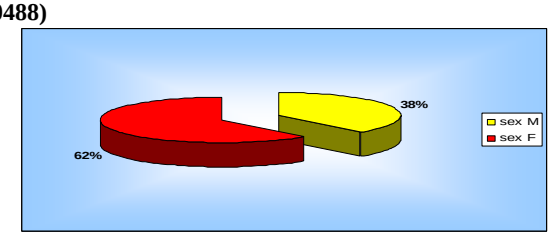
During the period of the study, from a total of 253 ICD patients tested, 94 were confirmed (37.15%). The ICD incidence was of 61.4 cases/10.000 discharged patients; the incidence density was of 0.85 cases/1000 patients-days (table no. 1).

Table no. 1. Incidence of ICD cases

Number of cases of ICD	Number of discharged patients	No. patients -days	Incidence (10.000 discharged cases)	Incidence density (1000 patients-days)
94	15.290	110.331	61,4	0,85

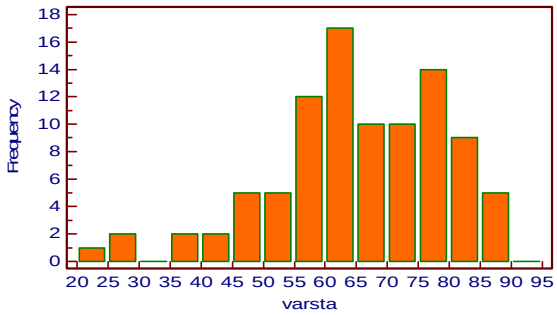
Among the patients with ICD, 36 (38.3%) were male and the remaining 58 (61.7%) were women (figure no. 2), this difference of the gender distribution was statistically significant (Wilcoxon test, p = 0, 0488).

Figure no. 2. Gender distribution of cases with ICD: significantly higher proportion of cases in females (p = 0.0488)



The median of the age of ICD cases was of 65 (95% CI, 63.00 to 70.86 for the median) (figure no. 3).

Figure no. 3. Distribution of ICD cases by age



Of the total ICD, 35 cases (37.23%) were nosocomial (ICDn), the remaining of 59 were contracted outside the hospital (62.76%). The incidence density of the nosocomial cases was 0.32 / 1000 patients-days, and the incidence of 22.9 / 10,000 discharged patients (table no. 2).

10 cases were contracted in the medical wards (28.6%), 21 in the surgical departments (60%) and 4 in ICU wards (11.4%) (figure no. 4). But if it were to calculate the incidence of the cases by the type of the departments, it shows that ICU wards are those that have the highest rate of ICDn: 0.88/1000 patients-days, followed by the surgery department - 0.50/1000 patients-days and the ones with medical profile- 0.15/1000 patients-days (table no. 3 and figure no. 5).

Table no. 2 Incidence of nosocomial ICD cases

Number of ICDn cases	Number of discharged patients	No. patients - days	Incidence (10.000 discharged cases)	Incidence density (1000 patients-days)
35	15.290	110.331	22, 9	0, 32

Table no. 3 ICDn incidence depending on the hospital wards

Wards	Number ICDn cases	No. patients-days	Incidence density (1000 patients-days)
Medical	10	64.326	0,15
Surgeon	21	41.459	0,50
ICU	4	4546	0,88

Figure no. 4. ICDn distribution onwards

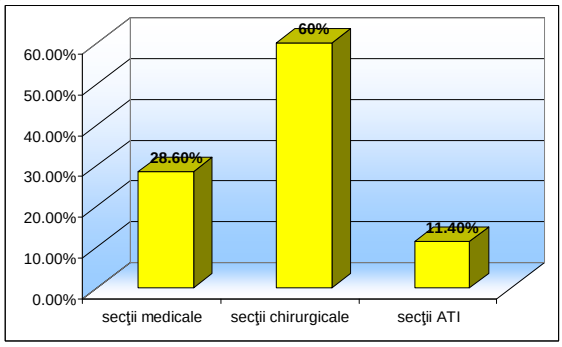
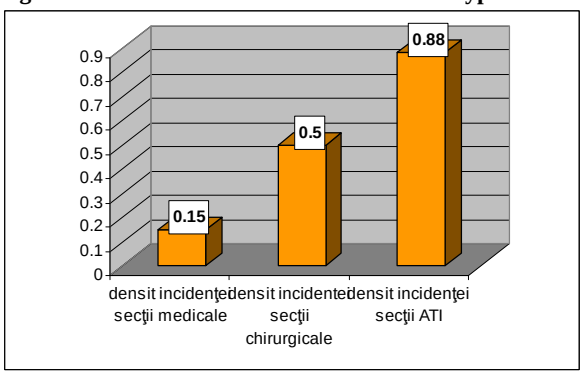
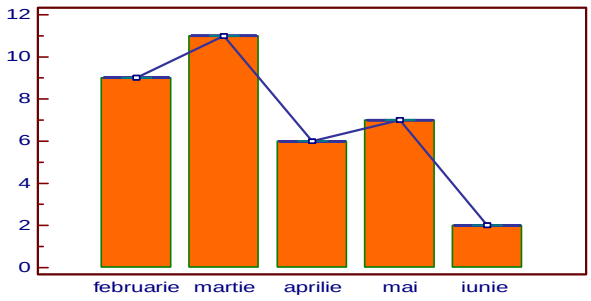


Figure no. 5. ICDn incidence distribution on types of wards



Most of the cases with nosocomial character were in the first two months of the surveillance interval; their identification allowed the implementation of the control measures that have reduced their numbers in the coming months (figure no. 6).

Figure no. 6. Distribution of ICDn cases depending on the month they have started



DISCUSSIONS

The percentage of over 37% of all cases confirmed by the laboratory from the total investigated cases suggests that the ICD is a serious public health problem both in hospitals and in the community. The problem of the diarrheal syndromes in the hospital after taking antibiotics is neither thinning nor new, but their etiological characterization is not possible without starting the etiological investigation in the laboratory in the hospitals. The small number of hospitals in Romania which currently provides for the etiologic diagnosis of Clostridium difficile explains the small number of cases reported in the country, compared with the data from other European countries, the United States or Canada. So, in the United States, there has been found, in a study during the years 2000-2005, a double number of ICD discharged from the adult hospitals (from 5.5 to 11.2 in 10,000 patients to 10,000 patients).(7) In Canada, a study carried out over six months in the hospitals of six different regions of the country found the average incidence rate of nosocomial ICD of 45 cases/10.000 hospitalized patients and 0,64/1000 patient-days, with significant variations from one hospital to another:(8) in the Quebec within up to 111 cases/10,000 patient admissions and 1.19 cases/1000 patient-days. In another study conducted in a hospital in Tuzla (Bosnia-Herzegovina) (9) during the years 2009-2012, it has been outlined an average incidence of nosocomial ICD of 0.22/1,000 patient-days and an annual rate of cases of 15,68/10,000 hospitalizations. In another study conducted in 106 hospitals in 34 European countries in 2008, it was found that the average incidence of cases of nosocomial ICD was of 0.41/1000 patient-days.(10) In a study conducted in Germany in 2007, the ICD incidence was of 46.5/10,000 patients and the incidence density of 0.661000 patient-days.(11)

Table no. 4. Incidences of ICD cases and of ICDn in several countries

Country	ICD incidence (10.000 patients)	Incidence Density ICD (1000 patients-days)	ICDn incidence (10.000 patients)	Incidence density ICD (1000 patients-days)
USA (2005)	11, 2	-	-	-
Canada (2007)	47, 4	-	45	0, 64
Bosnia Herzegovina (2009-2012)			15, 68	0, 22
Germany (2007)	46, 5	0, 66	-	0, 48
UE (2008)	-	-	-	0, 41
County hospital Romania (2014)	61, 4	0, 85	22, 9	0, 32

The differences between the incidences can be explained if one takes into account that hospitals differ depending on the targeted patients, the offered techniques of diagnosis and treatment, hygiene implemented practices etc. This study was conducted in a clinical emergency hospital that is at the beginning of ICD surveillance programme and includes a wide range of medical specialties, surgical and ICU services. The incidence rate of ICD cases of 61.4/10,000 discharged patients and the incidence density of 0.85/1000 patients-days are superior to those of the mentioned studies (table no. 4), which emphasizes once more that the ICD is an important problem in the hospitals from Romania. The incidence of nosocomial ICD cases of 22.9/10,000 discharged patients and of 0.32 cases/1000 patients-days are lower than the incidence of nosocomial ICD reported in Canada or other European countries, but is an important part of the morbidity with important costs in the hospital budget; the difference may result from the sensitivity of the surveillance systems of the nosocomial cases. In the studied hospital, ICU wards are actively monitored every week to identify the nosocomial infections: here, the incidence density of the nosocomial ICD was the highest, of 0.88/1000 patients-days, which is a higher value to those found in other countries, for example in the study from Germany, it was of 0.75 cases/1000 patients.(11) A feature of the study is the high incidence of the nosocomial cases in the surgical departments, in disagreement with the results of other studies: 0.50 ICD nosocomial cases/1000 patients-days in our study and 0.35 cases/1000 patients-days in the German study.(11) A plausible explanation is about the unjustified way of prescribing antibiotic prophylaxis in the surgical wards of our hospitals, disregarding the basic principles thereof and considering it often as a substitute for the proper surgical techniques and not as an adjunct thereof.

In the present study we found that ICD occurred in a number of female patients significantly higher than the proportion of male cases; most of the cases occurred in patients aged over 65 years, which is consistent with the data that mention this threshold among the additional risk factors for ICD.(12)

CONCLUSIONS

1. In the studied hospital, the total number of ICD diagnosed during 5 months was 94, from a total of 253 suspected cases. Of these, approx. 37% were nosocomial, the remaining above of 62% were imported cases.
2. During the studied period the incidence of all ICD cases was of 61.4/10,000 discharged patients; the incidence density was of 0.85 ICD cases /1000 patients-days. The incidence of the nosocomial cases was of 0.32/1000 patients-days, with the highest values in ICU wards.
3. Most cases of DCI were diagnosed in patients older than 65 years; women were more frequently affected by this disease than men, the difference being statistically significant.
4. In the hospitals, the recognition of this etiological entity among the diarrheal syndromes is of great importance, on the one hand for the rapid implementation of an appropriate therapy to reduce the progression to severe types and on the other hand, for the immediate implementation of the control procedures to avoid or limiting the nosocomial transmission of the disease.

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