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Clostridium difficile – still a problem among the XXI century of geriatic patients

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ABSTRACT

Introduction. The disease caused by *Clostridium difficile* (CzcD – *Clostridium difficile* -associated disease) – was defined by the Centres for Disease Control and Prevention in Atlanta in 2007 in order to standardize monitoring conditions of diarrhea caused by the bacterium *Clostridium difficile* [1]. It is a gram-positive bacterium forming part of intestinal flora that causes, among other, pseudomembranous colitis in elderly patients. It occures due to the destruction of anaerobic flora through the application of antibiotics and mass colonization of the bacterium *Clostridium difficile* in the large intestine. The diarrhea may resolve spontaneously but in older people often causes a severe form of life-threatening condition. [2–3]. The determinants which are the criteria for diagnosis of *Clostridium difficile* is a toxin A and/or B in the stool or demonstration of the presence of *Clostridium difficile* strain.

Aim. The aim of the study was evaluation of the bacterium *Clostridium difficile* infection in geriatric patients among hospitalized in Department of Geriatrics at Regional Hospital for Mental Diseases "Dziekanka" in Gniezno in the years 2015–2016 and comparison with the information of infections in the years 2012–2014 in the same department and the same hospital.

Material and Methods. The studied material consisted of data from the medical records based on 1342 patients from Regional Hospital for Nervous and Mental Patients "Dziekanka" in Gniezno. The following parameters were analysed: gender, age of the patient, duration of hospitalization, antibiotics before diarrhea, basic diseases and coexisting diseases.

Results. The study included in total 1342 patients. *Clostridium difficile* was diagnosed in 4 people which was 0.3% of all diagnosed patients. Among the coexisting diseases was diagnosed heart failure (50%), anemia (75%) and renal failure (50%). First-line treatment was vancomycin and metronidazole.

Conclusions. Prevention against infection with *Clostridium difficile* must be taken through early detection and implementation of medical procedures, medicines and sanitary-epidemiological procedures.

Keywords: infection, *Clostridium difficile*, elderly person.

Introduction

During the aging process a lot of irreversible changes in the systems and organs occur. This period is related to the presence of specific health problems, which result in a limitation of independence and self-reliance elderly patients. Moreover it is decreases the quality of life [4–5]. A major problem is a disruption the immune system lead to the reduction of vaccination response

and increased susceptibility of infection. Additionally the susceptibility of various types infection is also increased because of many chronic and devastating diseases which are presence. Clostridium difficile is dangerous pathogenic microorganism for elderly patients. It is caused by antibiotic opportunistic bacterium that causes gastrointestinal illness in humans. It produces toxins (A and B) and disputes resistant to high temperatures and any cleaner substance [6–7]. *Clostridium difficile* causes diarrhea that can be life-threatening to elderly patients which leads to hospitalization. Almost always the causes is prior antibiotic use (over 95%) especially fluoroquinolones, clindamycin and cephalosporins. Factors additional cause infection can be: bad hygiene staff (especially hands), age over 65 years, contact with infected persons, incorrect and inaccurate washing, cleaning. Because of bacteria items are (sinks, showers, bathtubs, toilet bowls, beds, tables and other equipment used for the care and rehabilitation of patients), lack of cleaning agents and appropriate disinfectants in this type of infection. The infection caused by the bacterium *Clostridium difficile* are; 1. not heavy, 2. heavy, 3. severe, fulminant, complicated [8]. In the case of diagnosis a particular form is taking a standard treatment procedure (**Figure 1**).

The diagnosis of *Clostridium difficile* included medical history, antibiotic testing of stool for the presence of toxins and bacteria, additional lab results and imaging studies [8]. The results confirm the presence of *Clostridium difficile* and they are the basis for implementation of medical procedures and also they are prevent spread of infection.

Aim

The aim of the study was evaluation of the bacterium *Clostridium difficile* infection in geriatric patients among hospitalized Department of Geriatrics at the Regional Hospital for Mental Diseases "Dziekanka" in Gniezno in the years 2015–2016 and compare the information of infections in the years 2012–2014 in the same department and the same hospital.

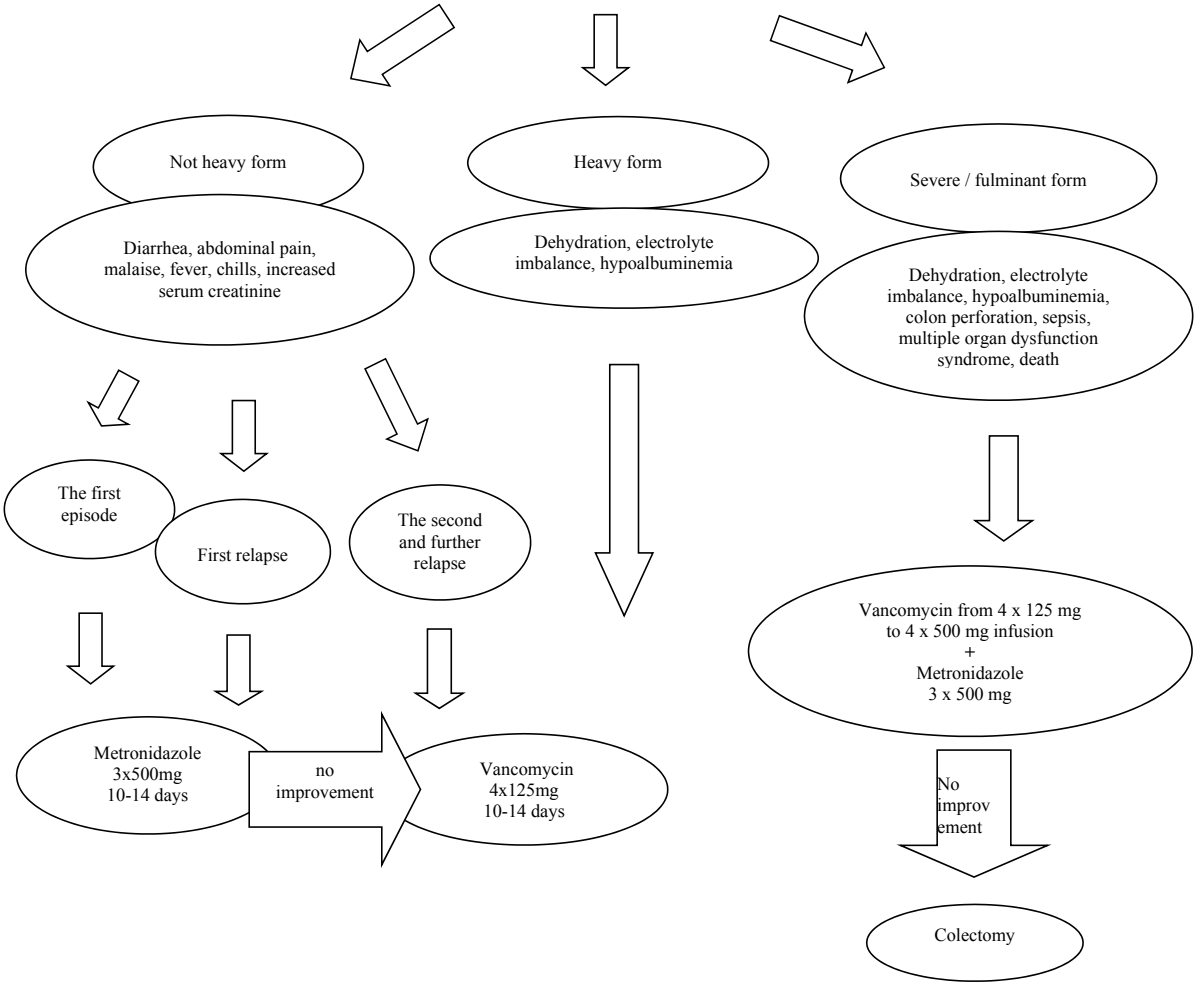

Figure 1. Forms of Clostridium difficile, clinical and standard treatment [8–9]

Material and Methods

Studied material consisted of data from the medical history of 1342 patients between 81 and 84 years old from Regional Hospital for Nervous and Mental Patients "Dziekanka" in Gniezno treated in the period from 01.01.2015 to 31.05.2016.

Retrospectively analyzed medical histories of patients with laboratory-confirmed infection of *Clostridium difficile*.

Similarly to that in the years 2012–2014 were taken into consideration the following parameters: gender, age of the patient, duration of hospitalization, antibiotics before the diarrhea, primary disease and coexisting disease.

The research results are based on Student's t-test for unrelated samples and the coefficient of Spearman's rank correlation. The level of statistical significance adopted level of $p < 0.05$.

Results

In the years 2015–2016 in the geriatric department of the Regional Hospital for Nervous and Mental Patients "Dziekanka" in Gniezno hospitalized in total 1342 patients. In the laboratory-confirmed infection of *Clostridium difficile* were 4 patients (2 females and 2 males, respectively 50% and 50%) between 81 and 84 years old (average age 84.5 years), representing 0.3% of the treated patients. In the years 2012–2014 *Clostridium difficile* was found in 16 patients (11 females and5 males, respectively 68.75% and 31.25%) between 71 and 96 years old (average age 83.3 years) acting 0.92% of all patients.

Analysis of aged patients with *Clostridium difficile* are presented in **Table 1**.

The average time of hospitalization in the department was 12.5 days (from 1 to 31 days). The data are presented in **Table 2**.

Nosocomial infection was diagnosed in 2 men (50%). The average age for this group of patients was 86.5 years. While community-acquired infections were observed in 2 women (50% average age 82.5 years). Indication for antibiotic treatment against diarrhea was bronchitis (1 male, 25%). In other cases they was no information about previous diseases.

Table 3 shows used antibiotics for patients with *Clostridium difficile* before diarrhea.

Clostridium difficile is the most frequently diagnosed with coexistence of heart failure (50%), anemia (75%), renal failure (50%). Other figures and percentages presented in **Table 4**. Moreover if patient has more coexisting diseases, the duration of hospitalization become to be longer ($p = 0.012719$). The data are shown in **Figure 2**.

Treatment of *Clostridium difficile* are presented in **Table 5**.

Among the analyzed group was found 1 death (50% in the group of females) – 84 years old woman with dementia, renal failure, malnutrition and dehydration. The differences were statistical significant ($p = 0.00452$).

For decrease of the *Clostridium difficile* incidence in the analyzed material is probably the impact of the

Table 1. The age distribution of patients with *Clostridium difficile* in the analyzed groups in the years 2012–2014 and 2015–2016

Age distribution	1.X.2012–31.XII.2014				1.I.2015–31.V.2016				p
	Females		Males		Females		Males		
	N	%	N	%	N	%	N	%	
65–75 years	1	9,09	2	40	0	0,00	0	0,00	0.468485
76–85 years	5	45,46	2	40	2	100,00	1	50,00	
86–95 years	4	36,36	1	20	0	0,00	1	50,00	
Over 95 years	1	9,09	0	0,00	0	0,00	0	0,00	
Total number	11	100,00	5	100,00	2	100,00	2	100,00	

Table 2. The average time of hospitalization patients with Clostridium difficile in 2012–2014 and 2015–2016 years

Hospitalization time	1.X.2012–31.XII.2014		1.I.2015–31.V.2016		p
	N	%	N	%	
1–10 days	3	18,75	2	50,00	0.012719
11–21 days	8	50,00	1	25,00	
22–35 days	4	25,00	1	25,00	
Over 36 days	1	6,25	0	0,00	

Table 3. Antibiotics used before diarrhea

Antibiotics used	1.X.2012–31.XII.2014		1.I.2015–31.V.2016	
	N	%	N	%
Amoxycillin with clavulanic acid	4	25,00	0	0,00
Amoxycillin with clavulanic acid + Clarithromycin	1	6,25	0	0,00
Amoxycillin with clavulanic acid + Ceftriaxone	1	6,25	0	0,00
Amoxycillin with clavulanic acid + Ciprofloxacin	1	6,25	0	0,00
Cefuroxime	4	25,00	1	25,00
Cefuroxime + Ciprofloxacin + Gentamicin	1	6,25	0	0,00
Ciprofloxacin	1	6,25	1	25,00
Unknown	3	18,75	2	50,00

Table 4. Coexisting diseases in hospitalized patients

Coexisting diseases	1.X.2012–31.XII.2014		1.I.2015–31.V.2016	
	N	%	N	%
Diabetes	7	43,75	0	0,00
Heart failure	9	56,25	2	50,00
COPD	4	25,00	0	0,00
Malnutrition, dehydration	9	56,25	1	25,00
Delirium	7	43,75	0	0,00
Stupor	7	43,75	1	25,00
Cancers	1	6,25	1	25,00
Strokes	5	31,25	0	0,00
Renal failure	6	37,5	2	50,00
Anemia	9	56,25	3	75,00

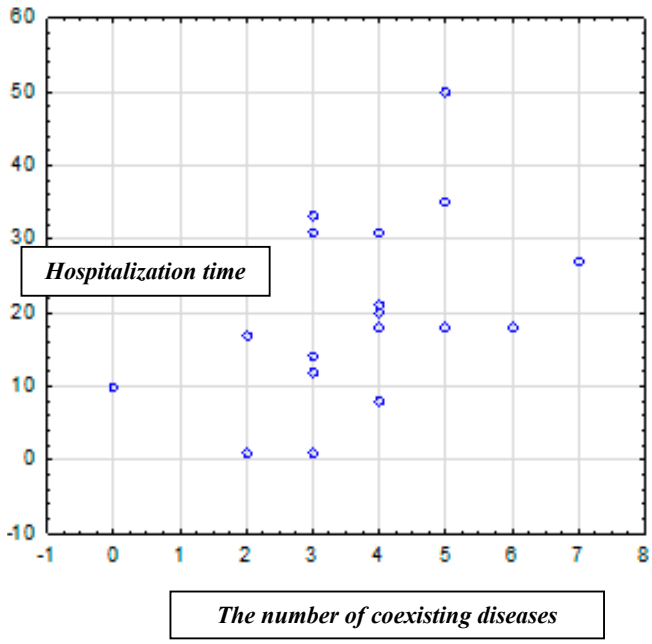

Figure 2. Dependence between the number of coexisting diseases and hospitalization time

effective control of infections. Aamong others; inclusion of sporicidal agents, disposable equipment, hand washing, isolation of the infected patient and microbiological diagnostics.

Screening test for *Clostridium difficile* infections is a test to detect the antigen GDH, which is characterized by high sensitivity. Furthermore it is recommended that in the case of a positive result GDH test. Should be use other available methods to confirm result – PCR (NAAT – amplification of nucleic acids), positive test A // B EIA test and Gene – Xpert *Clostridium difficile* PCR.

Table 5. Treatment of Clostridium difficile

Used antibiotic	1.X.2012–31.XII.2014		1.I.2015–31.V.2016	
	N	%	N	%
Vancomycin	10	62,5	2	50,00
Metronidazole	0	0,00	1	25,00
Vancomycin+ Metronidazole	5	31,25	0	00,00
No treatment	1	6,25	1	25,00

Table 6. Mortality in patients hospitalized in the 2012–2014 and 2015–2016 years

Deaths	1.X.2012–31.XII.2014				1.I.2015–31.V.2016			
	Females		Males		Females		Males	
	N	%	N	%	N	%	N	%
	5	45,45	3	60,00	1	25,00	0	0,00
Total number	5	100	3	100	1	100	0	100

The use of a reasonable antibiotic therapy – empiric therapy – should be used only until a positive result of microbiological examination.

Then applied antibiotic should be strict according to antibiogram. Antibiotics are not given without observed clinical symptoms of infection and colonization occurs.

The administration of probiotics is one way of preventing diarrhea. Probiotics reduce the risk of diarrhea associated with antibiotic therapy. The oral administration of Lactic acid bacteria, Saccharomyces boulardii in an amount of 250 mg twice a day for 4 to 6 weeks. Furthermore probiotics Lactobacillus rhamnosus, Saccharomyces boulardii takes in conjunction with vancomycin to reduce the incidence of recurrence of *Clostridium difficile* from 50 to 16%.

Discussion

Clostridium difficile at the beginning of the twenty-first century remains a serious medico – social problem. Some of the most common risk factors of *Clostridium difficile* include hospitalization constituting 20–30% compared to 3% of the general population [10]. The incidence of *Clostridium difficile* among the patients hospitalized depends on the frequency of used antibiotics and it is 1–10/1000 patients [11–12]. This is confirmed by our research. During the years 2012–2014 *Clostridium difficile* constituted 6.97 / 1000 hospitalization, while currently 2.98 / 1000 hospitalization.

Decrease of immunity, age and gender are the risk factors for nosocomial of *Clostridium difficile*. Furthermore medical procedures, ie. mechanical ventilation, antibiotics, parenteral nutrition, steroid treatment, diabetes take a significant role in the development of *Clostridium difficile* [13]. In the case of recurrence risk factors are; age over 65 years, continue antibiotic treatment and severe disease. Studies of Brown et al. [14] showed increased risk for *Clostridium difficile* in patients treated with cephalosporins, carbapenems, monobactams and clindamycin and the reduction after use of macrolides, penicillins and sulphonamide.

Currently there are unknown accurate statistics associated with mortality of *Clostridium difficile* in Poland. In the United States the overall mortality rate is estimated at 23.7 / 1,000,000 [15–16] while the mortality rate among patients treated in the Intensive Care Unit is estimated at 6.1%. In our studies in the years 2012–2014 mortality was high – 50%, while in the years 2015 to 2016 – 25%.

Currently all over the world as well as in Poland it's tends to seek the best solutions in the case of a patient diagnosed with the pathogen- *Clostridium difficile*:

- inform the State Sanitary Inspectorate – in the first 24 hours,
- patient isolation,
- observance the rules of contact isolation,
- daily disinfection of surface with Chlorine-Clean liquid,
- use disposable bed sheets,
- worn bedding disposable to the medical waste, and then burn it,
- for washing hands, only the chlorhexidine – (Hydrex); disinfection alcohol only after washing your hands above,
- in the case of discharge or relocation the patient: thorough disinfection of surfaces and equipment with Chlorine-Clean 10,000 ppm for 15 minutes and then ventilate the room,
- newspapers, books should be packed inside a red bag and pass to burn,

– personal clothes should be utilization or disinfected after consultation with the patient or patient family.

Effective method of limiting the spread of *Clostridium difficile* infection is the isolation of a patient suspected of being infected and isolation of a patient diagnosed with infection by providing:

– separate room with a sink with a battery that runs without any contact with the hands,
– dispenser with disinfectant that run without contact with the hands,
– container with disposable towels and container for used towels,
– isolation room equipped with negative pressure ventilation,
– lock room, sink – aprons equipped with: a sink with a battery that runs without any contact with the hands; dispenser of liquid soap; dispenser with disinfectant that run without contact with the hands; container with disposable towels and a container for used towels; closed container for dirty clothes; space for clothes by separating clean and dirty clothes [17].

Furthermore;

– before entering the room use disposable aprons,
– washing your hands after contact with a patient,
– isolation of the patient for period of 48 hours after the resolution of diarrhea and stool formation [18],
– use sterile disposable gloves for treatment under aseptic conditions, sterile handling equipment,
– use non-sterile disposable gloves for all procedures that may lead to contact with blood, body fluids, excretions, secretions; contact with mucous membranes or broken skin,
– use masks during procedures with the existing risk of aerosols formation, splashes of blood or body fluids; preventing the spread of microorganisms from the nose and mouth during coughing and sneezing.

Rules of preventive procedure in patients with geriatric age:

– use antibiotics only in justified cases,
– use antibiotics after microbiological diagnostics,
– prevention of infections,
– compliance with sanitary regime.

Conclusions

– Take preventive actions of infection with *Clostridium difficile* through early detection and implementation of medical procedures, medicines and sanitary-epidemiological procedures.
– Use and observance the principles of prevention reduced the incidence of *Clostridium difficile* infections in the geriatric ward.

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Conflict of interest statement
The authors declare no conflict of interest.

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