ACUTE BACTERIAL GASTROENTERITIS AS HOSPITAL-ACQUIRED INFECTION IN PEDIATRICS

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ACUTE BACTERIAL GASTROENTERITIS AS HOSPITAL-ACQUIRED INFECTION IN PEDIATRICS (Abstract): Gastroenteritis as hospital-acquired infection represents one of the most important issue to be managed in pediatric units. **Material and methods**: The descriptive study was conducted on a group of 536 cases with bacterial gastroenteritis as healthcare associated infections (HAIs), admitted in „Sf. Maria" Children's Emergency Hospital, Iasi, during 2013-2016. **Results**: Distribution according to pathogens detected by specific investigations showed that *Campylobacter* (69.77%) was involved in most cases of gastroenteritis, followed by those determined by *Salmonella* (21.45%). Distribution by age group highlighted that children of 0-1-year-old were the most affected and *Campylobacter* was the most involved pathogen in gastroenteritis of that age group, followed by cases with *Salmonella* gastroenteritis. Children from 2-6 and 6-11-years age groups were involved in gastroenteritis with *Salmonella* followed by that with *Campylobacter*. Children of 12-18-years-old were admitted with gastroenteritis due to *Salmonella*, then *E. coli*. *Shigella spp.* was isolated in 10 cases, and *Yersinia spp.* in only 3 cases. **Conclusions**: The issue of gastroenteritis as a hospital-acquired infection remains hereafter the keystone of hospital management, as well as prevention and control strategies. **Keywords**: ACUTE BACTERIAL GASTROENTERITIS, HEALTH CARE-ASSOCIATED INFECTION, PEDIATRICS.

Healthcare-associated infections (HAIs), which were previously referred to as nosocomial infections, are an important public health problem generated by medical practice involving patients, but also medical, paramedical and non-medical staff, which ensure the functionality of hospitals. They have an important impact on the healthcare system, due to the increased morbidity, mortality, and long-term hospitalization costs (1).

The current features of HAIs in pediatric units are determined by a variety of factors: low patient age, prematurity / dysmaturity, immunodeficiency status, alteration of anatomical defense barriers, congenital malformations and/or associated pathologies, prolonged hospitalizations, increasing number of surgical interventions, the multitude of diagnostic and therapeutic procedures, some of them invasive, the abuse of broad spectrum antibiotics, often unjustified, the occurrence of bacteri-

al multidrug resistance to antibiotics (1, 2).

Early detection by screening of patients colonized or infected with multiple resistance bacteria is an important and useful intervention that can be easily implemented and can have a significant impact, increasing the population health. Bacterial screening in carriers, as part of HAIs control programs, allows the implementation of preventive measures to avoid transmission of these infections. To increase the performance of these screening programs, it is necessary to involve the clinical laboratory, hospital management staff (epidemiologist, infectious disease specialist, medical assistant specialized in HAIs control), as well as the involvement of the management team and the hospital administration (1-3).

A screening program for early detection of patients colonized or infected with multidrug resistant bacteria (MDR) at the very hospital admission could achieve several objectives such as: controlling the transmission of MDR bacteria in hospital units; reducing the prevalence of MDR microorganisms and thus reducing incidence or preventing the occurrence of serious infections (sepsis, pneumonia, etc.) in hospitalized patients, increasing awareness of MDR-associated risk among healthcare professionals, standardizing the detection of MDR bacteria in the laboratory; supporting a national strategy to control the transmission of MDR and HAIs with such microorganisms. In the hospital environment, there are many microorganisms that can be the cause of HAIs development and evolution when there is a break in cleaning, disinfection, inadequate unhygienic behaviors. The most common way of transmission of HAIs is represented by the hands of medical staff, so that, a proper hygiene of hands is the basis of any prevention and control program, with an important role in reducing the transmission of infections, as well as the dissemination of resistant germs. Hand hygiene generated many controversies, evidence-based arguments, and research. Improving patient hygiene, access to clean water, keeping HAIs under control might be key elements for reducing antibiotic resistance (1, 2).

MATERIAL AND METHODS

The descriptive study was conducted on a group of 536 cases with bacterial gastroenteritis as healthcare associated infections (HAIs), admitted in "Sf. Maria" Children's Emergency Hospital, Iasi, during 2013-2016. Inclusion criteria were the diagnosis of bacterial gastroenteritis with *Salmonella*, *Shigella spp*, *Campylobacter*, *Yersinia spp*, other bacterial infections, based on laboratory investigations and contracted during the hospitalization; the exclusion criteria were represented only by the diagnosis of viral, food, or allergic gastroenteritis.

The data were collected retrospectively from patient records and HAIs reporting files, subsequently statistically processed using the *SPSS 20.0* software. The age groups cases were processed in accordance with international standards (4).

RESULTS

Most cases of bacterial gastroenteritis diagnosed as HAIs were reported in 2015 (154 cases-28.73% of the total), and the lowest in 2013 (21.26%). There is an upward trend in their incidence (fig. 1).

Gender distribution showed a slight predominance of boys (295 cases-55.03%), only in 2014 prevailing female gender. Distribution according to pathogens detected by specific investigations showed that *Campylobacter* (374 cases-69.77%) was involved in most cases of gastroenteritis, followed by those determined by *Salmonel-*

la (115 cases-21.45%). Distribution by year of study showed that most of *Campylobacter* cases were admitted in 2015 (115 cases-30.74%) and gastroenteritis with Salmonella had an incidence peak in 2014 (43-37.39%) (tab. I, fig. 2).

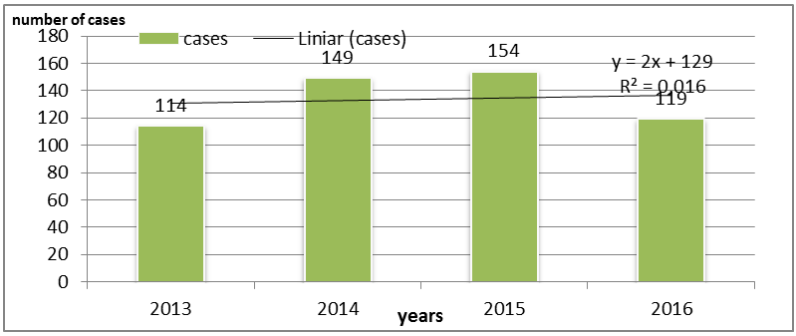

Fig. 1. Distribution of total cases by years

TABLE I

Distribution of bacterial infections cases pathogens by year of study and gender

Years / Pathogens	2013			2014			2015			2016		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Salmonella	12	15	27	25	18	43	11	15	26	12	7	19
Shigella	1	3	4	2	2	4	0	1	1	2	0	2
E. coli	0	0	0	4	1	5	5	4	9	2	7	9
Campylobacter	46	34	80	46	49	95	69	46	115	53	31	84
Yersinia enterocolitica	0	2	2	1	0	1	0	0	0	0	0	0
Others	0	1	1	0	1	1	1	2	3	3	2	5
Total	59	53	**114**	78	73	**149**	86	68	**154**	72	47	**119**

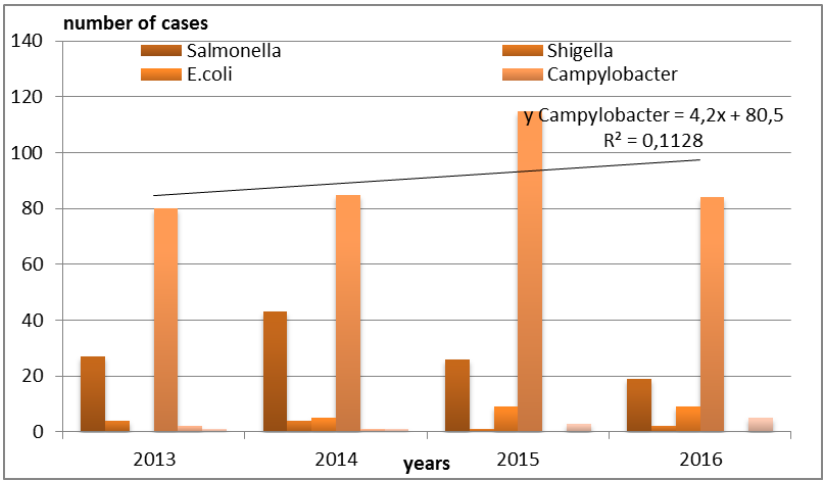

Fig. 2. Distribution of pathogens by year of study

Distribution by age group highlighted children of 0-1-year-old were the most affected (417 cases-77.79%) and *Campylobacter* was the most involved pathogen in gastroenteritis of that age group (337 cases-80.81%), with a peak of incidence in 2014 (107 cases-25.65%), followed by cases with *Salmonella* gastroenteritis (59 cases-14.14%). Children from 2-6-year age group were also involved in gastroenteritis with *Salmonella* (37 cases-53.63% of the total cases from that age group), followed by *Campylobacter* (28 cases-40.57%). Patients of 6-11-years- old suffered from gastroenteritis with *Salmonella* (12 cases-48.00%) and *Campylobacter* (6 cases-24.00%). Children of 12-18 years old were admitted with gastroenteritis due to *Salmonella* (7 cases-28.00%), then *E. coli* (11 cases-44.00%). *Shigella spp.* was isolated in patients with gastroenteritis as HAIs in our study group in 10 cases (1.86%). *Yersinia spp.* was also involved in gastroenteritis etiology, but in few cases (3 cases of our study group-0.55%) (tab. II).

TABLE II

Distribution of bacterial infections cases by age groups

Year	Pathogens	Age groups				
		0-1 years	2-5 years	6-11 years	12-18 years	Total
2013	***Salmonella***	14	10	2	1	
	Shigella	1	0	3	0	
	E. coli	0	0	0	0	
	Campylobacter	71	8	1	0	
	Yersinia enterocolitica	1	0	0	1	
	Others	1	0	0	0	**114**
2014	***Salmonella***	19	13	7	4	
	Shigella	2	1	0	1	
	E. coli	1	0	1	3	
	Campylobacter	84	6	2	3	
	Yersinia enterocolitica	1	0	0	0	
	Others	1	0	0	0	**149**
2015	***Salmonella***	18	6	1	1	
	Shigella	0	0	1	0	
	E. coli	6	1	0	2	
	Campylobacter	107	6	2	0	
	Yersinia enterocolitica	0	0	0	0	
	Others	2	0	1	0	**154**
2016	***Salmonella***	8	8	2	1	
	Shigella	0	2	0	0	
	E. coli	2	0	1	6	
	Campylobacter	75	8	1	0	
	Yersinia enterocolitica	0	0	0	0	
	Others	3	0	0	2	**119**
Total		**417**	**69**	**25**	**25**	**536**

DISCUSSION

Salmonella spp. has gained a distinct status over the last decades, becoming the first amongst pathogens that can contaminate the

food and the external environment involved in sporadic cases of gastroenteritis and outbreaks of food poisoning. Incidence of gastroenteritis with *Salmonella spp*. has increased greatly in almost all regions of the globe. In Western Europe, *Salmonella enteritidis* has become the dominant strain (5, 6).

Morbidity and mortality data are imprecise: there is no reporting system for *Salmonella spp*. isolated in humans, animal or food of animal origin, and the cause of death is not always the salmonellosis etiology. Only the investigation of the *Salmonella* food outbreaks can provide a clear description of this public health problem. Due to the widespread and a high probability of outbreaks and epidemics, several types of surveillance and control programs for *Salmonella* infections were implemented, such as those in Denmark, the United States, Australia and other countries. A Surveillance Program of these diseases has been implemented in the European Union since 2003, focused on food quality (7).

Diarrheal diseases with *Shigella spp*. are endemic worldwide and with extremely high levels of prevalence in undeveloped countries. Shigellosis is a very contagious disease and a frequent cause of death in children under 5 years of age. The United States is currently report a prevalence of 6-10% and the most affected age group is of 0-4 years. In Romania, the incidence of shigellosis had a decreased trend, from 130.6%ooo in 1975 to 31.8 in 1990 and to 6.7 in 2004. *Shigella flexneri* is the most intense circulation strain in Romania followed by *S. sonnei* (especially in Banat and Transylvania regions). *S. dysenteriae* has not been isolated in Romania since 1955. It is noticed that *S. sonnei* circulation is more intense in developed areas. Children were the most affected in regions where the disease is epidemic. Receptivity decreases with the age and epidemiological observations suggest the introduction of specific serotype immunity (8).

Incidence of diarrheal infections with *Campylobacter* tends to have the same position as incidences of infections caused by non-typhoid *Salmonella*. The incidence is higher in the summer season in temperate areas, but there is no seasonality in tropical areas. The morbidity evaluation and management is based on bacteriologically confirmed cases. The United States reported an incidence of 5-6%ooo. Campylobacter infections are hyper-endemic, endemic, or as outbreaks in developed countries with hygienic standards). In Thailand, *Campylobacter* infections seem to dominate the bacterial etiology of diarrheal diseases, and *C. jejuni* serotypes 36, 4 and 11 being encountered at the highest frequency. The highest rates of hospitalization for *Campylobacter* infections (74-78%) were reported by Cyprus, Latvia, Lithuania, Romania, and the United Kingdom. At the same time, Cyprus, Latvia, and Romania have the lowest number of reported cases, pointing out that surveillance in these territories manages to include only severe cases. UK reported 20 deaths of a total of 31 deaths registered in EU, in 2012. In the United States, the incidence of *Campylobacter* infections has declined towards the end of the 1990s and remains at low levels after the implementation of hygiene measures on drinking water disinfection and using chlorinated water in food industry (9-11).

In 40-90% of pediatric patients admitted in intensive care units there is an increased risk of diarrhea as HAI. Infectious diarrhea is usually more severe than non-infectious diarrhea, increasing the frequency of cardiac complications (arrhythmias) due to associated hydro-electrolytic imbalances, cardiopulmonary instability requiring vas-

opressors and mechanical ventilation or intraabdominal complications. An important problem too is the transmission of pathogens from patient to patient, from patient to healthcare worker as HAI outbreaks (12).

When a single case of *Salmonella* infection occurs, it should be checked if the infection is HAI or not. Epidemic investigations should assess food manipulation, inter-patient transmissions, or nurse to patient transmission. Standard detergents for hospitals and alcohol-based hand hygiene products are effective against *Salmonella spp*. Contact precautions are reserved for patients with incontinence or colostomy to control HAI outbreaks (12-14).

CONCLUSIONS

Our study highlighted that gastroenteritis with *Campylobacter* was most commonly reported in pediatric wards, especially in infants of 0-1-year-old and children of 2-6-year-old, followed by cases with *Salmonella*. The issue of gastroenteritis as a hospital-acquired infection remains hereafter the keystone of hospital management, as well as prevention and control strategies.

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