EPIDEMIOLOGICAL FEATURES OF DIARRHEAL INFECTIONS IN UKRAINE

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Infectious diseases continue causing the significant damage to humanity. 1.7 billion cases of diarrheal diseases are reported in the world every year [1]. About 2.2 million of people, mostly children, die due to these infections.

Rotavirus infection (RVI) holds a special place in the structure of intestinal infections as under the current conditions, it is one of the most popular intestinal infections in the world causing social and economic damage [2]. The researchers state the increasing role of opportunistic microorganisms (OP) as the agents of diarrheal infections and food poisonings of bacterial etiology [3]. They are endemic in the environment, and are the resident representatives of normal human flora. Salmonellosis are assuming greater significance year by year.

The current system of epidemiological surveillance in Ukraine is limited to the monitoring of acute enteric infections (AEI) cases and environmental culturing of patients or, more rarely, environmental media. At the same time there is no virologic diagnostics of diarrheal infections and no control of environmental media. That's why many issues of intestinal infection epidemiology, caused by viruses and OP, remain understudied.

Research objective is to explore the features of epidemic process of AEI in Ukraine in order to optimize preventive activities.

Research materials and methods. AEI incidence in 2001-2015 in Ukraine was analyzed based on the official statistical reports. According to the information given by SI "The Ukrainian Center for Disease Control and Monitoring of the Ministry of Health in Ukraine" the investigation was held on the nature of AEI epidemic outbreaks in 2015, based on the ways of agent transmission, groups of affected quota, etiological agents.

The descriptive and analytical approaches of epidemiological methods of researches, statistical methods were used in the paper.

Research results and their discussion.

Under the current conditions in Ukraine AEI take the major part in the infectious diseases structure. According to the official statistical reports of MOH in Ukraine, annual incidence of diarrheal infections is beaten only by the incidence of acute respiratory tract infections of multiple or unspecified localization. From 95,624 to 105,254 cases of AEI were recorded in Ukraine every year during 2011-2016, that exceeded the amount of any other reported cases of infectious diseases, except for acute respiratory diseases.

It was established that specific gravity of the reported cases oftyphoid fever, paratyphoid fevers A, B, C, cholera, campylobacteriosis and intestinal yersiniosis didn't exceed 0.1 %, shigellosis – 1.8 %, salmonellosis and rotavirus enteritis (RVE) – 10.3 і 12.5 % accordingly. Each third case of AEI within Ukraine was etiologically undeciphered, and almost 39 % was caused by other agents, besides the ones listed above (Fig. 1).
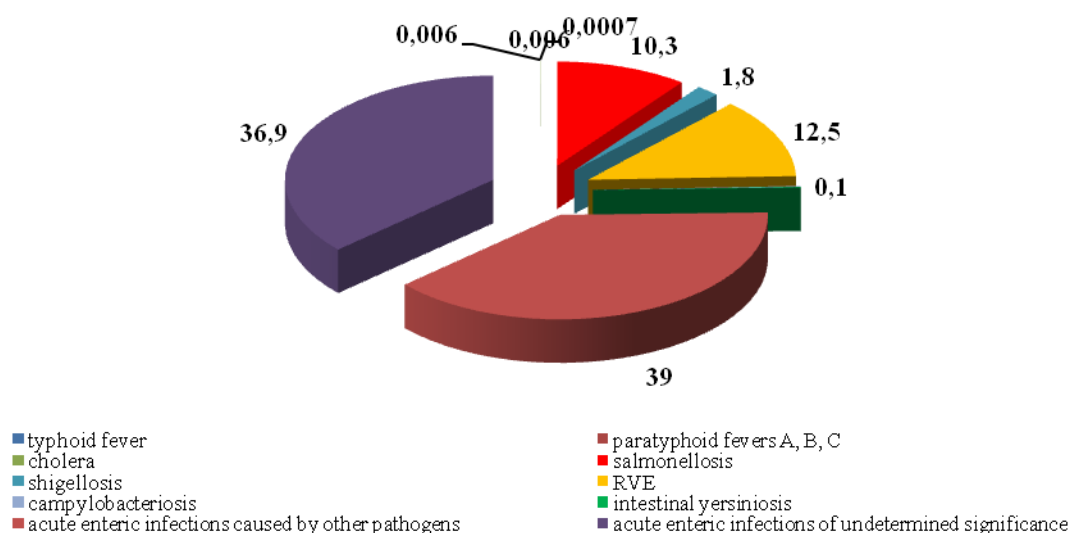
Fig. 1 Specific gravity of diarrheal infection incidence in Ukraine in 2011-2016

Salmonellosis - one of the most common acute enteric infections – has a global reach and is relevant for the majority of countries all over the world [4, 5]. Continuous processes of globalization, changes in food production technology,

stereotypes of consumatory behaviour of the population, intensive growth of international commodity exchange, migration and tourism contribute to widespread salmonella in the world. In the period under investigation the incidence in Ukraine ranged from 18.5 per 100 thousand people in 2011 to 24.1 in 2013 (median incidence 19.84 per 100 thousand people). Herewith, it was found that the highest rates were registered in Kharkiv (median incidence - 53.4), Khmelnytskyi (29.9), Cherkasy (30.2) regions. The lowest ones were in Kherson and Ternopil regions (median incidence 8.4 and 4.7 per 100 people accordingly) (Fig. 2).
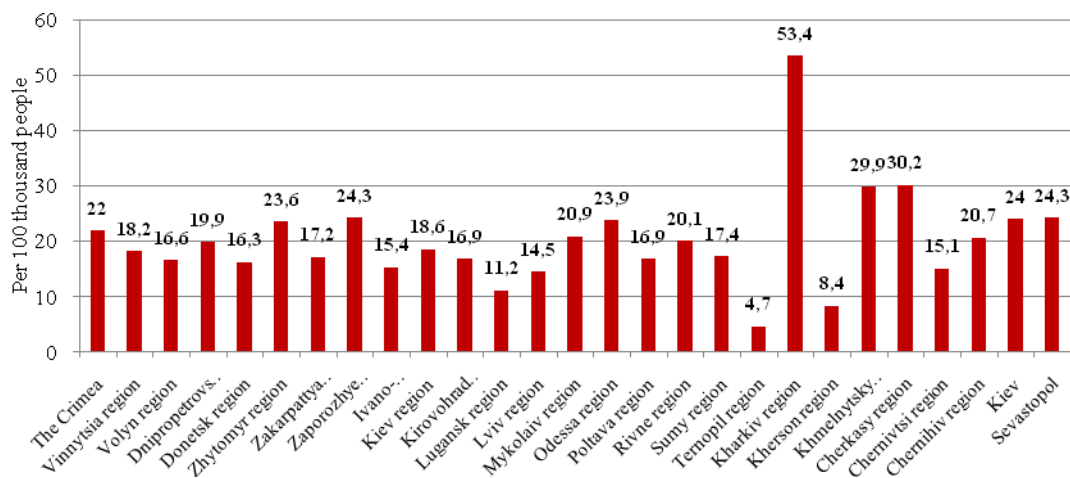
**Fig. 2** Salmonellosis median incidence in Ukraine (2011-2016)

The incidence of AEI caused by other pathogens (AEICOP) in Ukraine ranged from 115.5 in 2012 to 123.27 in 2015 (median incidence - 118.32 per 100 thousand people). The highest incidence rates are in Zaporizhzhia (median incidence - 320.7 per 100 thousand people), Odessa (165.1), and Kharkiv (150.1 per 100 thousand people) regions. The lowest rates are in Ternopil and Zakarpattia regions (median incidence is 43.0 and 37.6 per 100 thousand people accordingly) (Fig. 3).
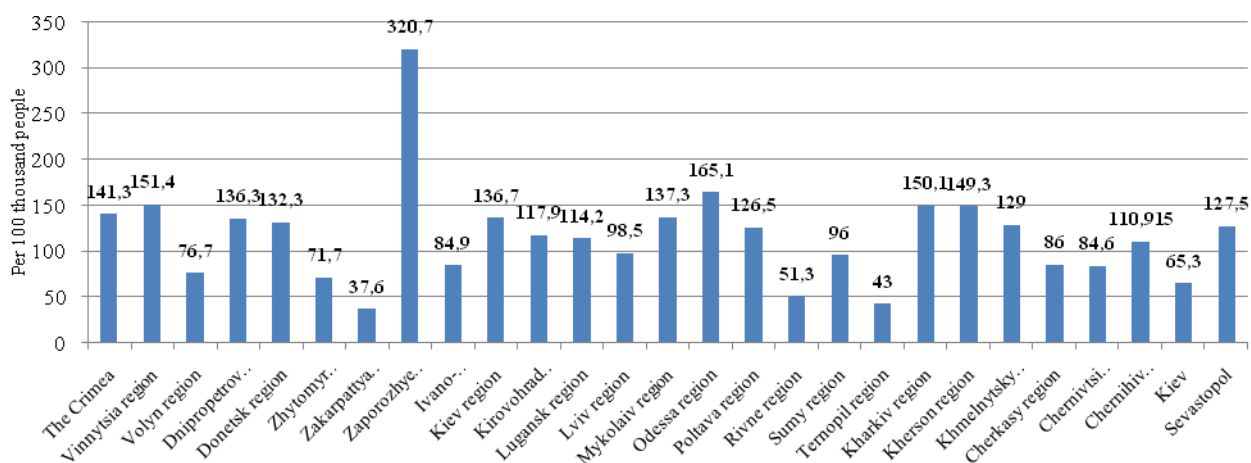
Fig. 3 The median incidence of acute enteric infections caused by other pathogens in Ukraine (2011-2016)

The AEICOP group includes the cases of rotavirus enteritis (RVE), campylobacteriosis, intestinal yersiniosis, which are separately registered in Ukraine. Their specific gravity varies in AEICOP structure in different regions, but the prevailing number of AEICOP was caused by opportunistic microorganisms, diarrheal Escherichia and Rotaviruses.

Nowadays rotavirus infection (RVI) is the most massive intestinal infection almost all over the world [6]. RVI registration in Ukraine has been started since 1995. Since then, the incidence rates have been constantly increasing due to the improvement of AEI diagnostics laboratory. In 2011-2016 the incidence rate of RVI in Ukraine varied within 18.97-30.95 per 100 thousand people (median incidence – 24.66 per 100 thousand people) (Fig. 4).
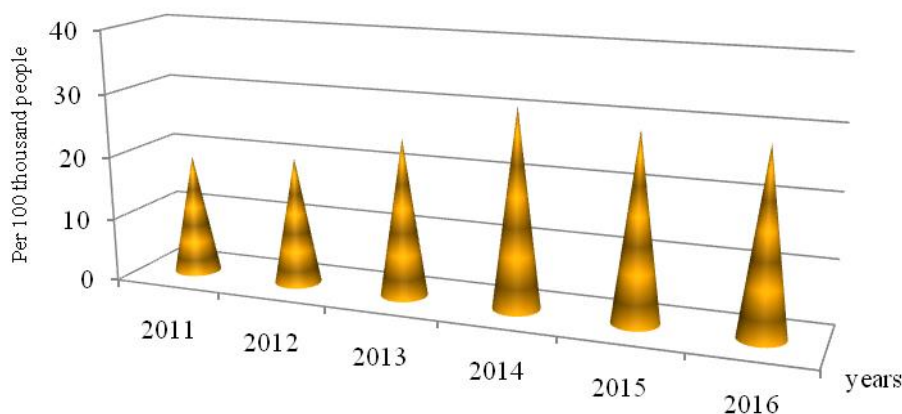
Fig. 4 RVE incidence in Ukraine

The highest rates were in Zaporizhzhia, Dnipropetrovsk, Odessa regions (median incidence 125.9; 35.8; 33.6 per 100 thousand people accordingly). The lowest were in Ternopil and Kirovohrad regions (6.5 and 3.5 per 100 thousand people accordingly).

Over recent years the researchers found that campylobacteriosis has taken a significant place in the AEI structure, and Campylobacter bacteria are its etiological agents. This microorganism has been discovered relatively recently, but its responsibility for disease development of livestock and poultry puts it in the category of veterinary pathology problems. Globally, the proportion of campylobacteriosis in diarrheal disease structure is 8.4 % (the 4th place) (after rotavirus, typhoid and cryptosporidiosis). The true frequency of gastroenteritis caused Campylobacter spp. is difficult to accurately determine due to underreporting, particularly in Low- and Middle-income countries [15]. In Ukraine the cases of campylobacterial enteritis were reported only in 6 regions (Zaporizhzhia, Dnipropetrovsk, Vinnytsia, Volyn, Odessa and Chernihiv) and in Kyiv. And its incidence indicators ranged from 0.06 to 6.25 per 100 thousand people.

The incidence level of intestinal yersiniosis is higher in highly developed countries with high economic level and well-developed food industry. In the Russian Federation the incidence varies from 1.38 to 2.75 per 100 thousand people, and in some areas the incidence is 40-50 and even reaches 138 per 100 thousand people [7], in the Republic of Belarus it is 3.8 per 100 thousand people [8]. In Ukraine, in 2011-2016 the incidence of enteritis, caused by Yersinia enterocolitica varied within 0.17-0.22 per 100 thousand people.

It is common knowledge, that the situation with acute enteric infections may be much more complicated because of the emergence of disease flare-up. 95 outbreaks of AEI were reported in Ukraine for 12 months of 2015, which is almost

1.8 times more than in 2014, 2.7 times more than in 2013 and 4.5 times more than in 2012. Most of AEI outbreaks were reported in Kyiv, Cherkasy, Lviv and Kharkiv regions (Fig. 5), some few outbreaks - in Vinnytsia and Dnipropetrovsk regions.
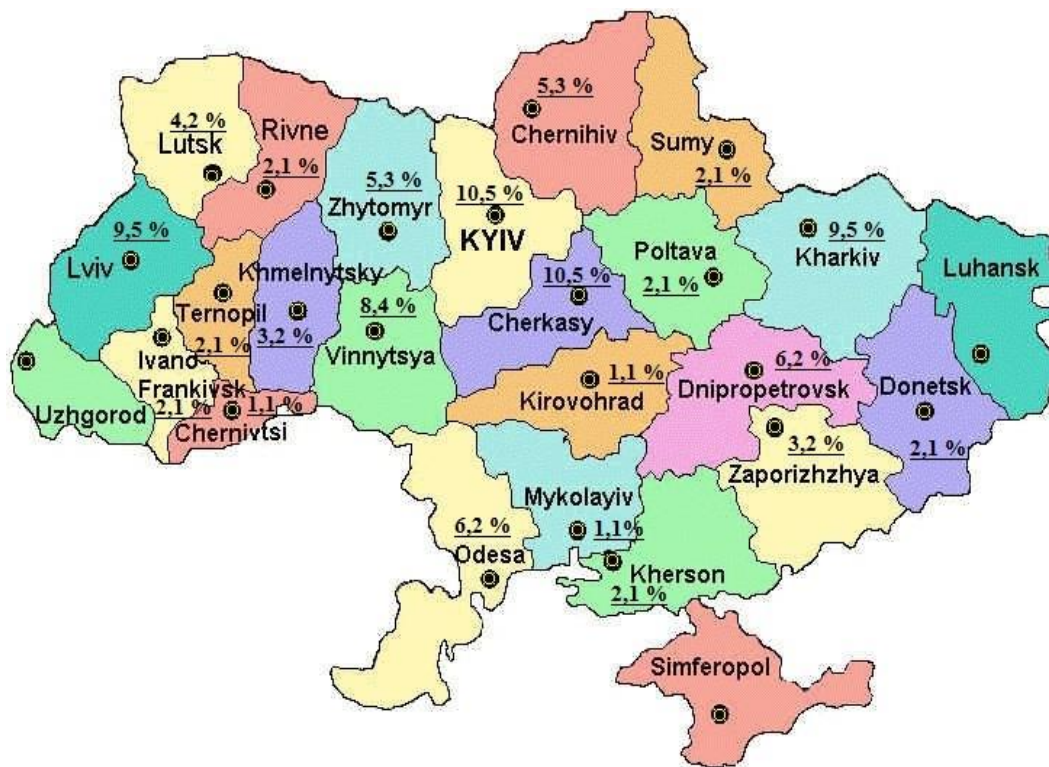
Fig. 5 Acute enteric infections outbreaks distribution in Ukraine in 2015 (%)

These outbreaks affected 1439 people, including 675 children or 46.9 %. The outbreaks were recorded among the population of certain areas locally as well as in organized groups (pre-school institutions, secondary schools, summer health institutions, healthcare organizations, industries) (Table 1).

Month distribution of diarrheal infection outbreaks is characterized with discretisation. Months of outbreak registration peaks were in September (17.8 %), January (10.5 %), August (10.5 %), June (9.5 %). The least peaks were recorded in February (4.2 %), October (5.3 %) and November (5.3 %).

Table 1

Outbreaks distribution by location of their emergence

Location of the emergence	Number of outbreaks		Number of affected people		Nidus index
	Total	%	Total	%	
Among the population of certain areas	26	27.4	499	34.7	19.2
Public catering	30	31.6	487	33.8	16.2
Pre-school institutions	24	25.3	263	18.3	10.9
Schools	4	4.2	45	3.1	11.2
Vocational schools	2	2.1	42	2.9	21
Summer health events	4	4.2	56	3.9	14
Healthcare organizations	1	1.0	7	0.5	7
Industrial enterprises	4	4.2	40	2.8	10
Total	95	100	1439	100	15.1

The AEI outbreaks were caused by S. *enteritidis, S.typhimurium*, rotaviruses, conditionally pathogenic bacteria (Table 2). In 37 cases (38.9 %) AEI outbreaks or AEI of unknown etiology or mixed (Salmonella, viruses, OP) were reported.

The outbreaks of salmonella etiology predominated. The largest number of salmonella outbreaks was registered in Kharkiv region - 7 niduses (14.6 % of the total number), 5 (10.4 %) – in each Cherkasy and Lviv regions, 4 (8.3 %) - in each Zhytomyr and Chernihiv regions, 3 (6.3 %) – in each Vinnytsia, Khmelnytskyi and Volyn regions and 2 (4.2 %) – in each Zaporizhzhia, Dnipropetrovsk and Kyiv regions. 89.6 % cases of outbreaks were caused by *S. enteritidis,* 2.1% –*S. typhimurium*, 6.2 % – *S. blegdam*, 2.1 % –*S. glostrup.*

RVI outbreaks were registered in 8 regions: Volyn, Dnipropetrovsk (2 outbreaks), Donetsk, Mykolaiv, Odessa, Rivne, Ternopil (2 outbreaks) and Cherkasy (4 outbreaks) regions. In (66.7±12.2) % of RVI cases the outbreaks were detected in pre-school institutions (PSI), in (20.0±10.3) % – in schools and colleges, in (13.3±8.8) % cases– among the population which used polluted water.

The number of children suffering from RVI in the nidus, which appeared in child welfare institutions, varied from 3 to 10 people.

Table 2

Outbreaks distribution by etiology

Etiology	Number of outbreaks		Number of affected people		Nidus index
	Total	%	Total	%	
S. enteritidis	43	45.3	527	36.6	12.3
Rotavirus	13	13.7	97	6.7	7.5
BFP of staphylococcal etiology	2	2.1	114	7.9	57.0
Viruses, salmonella, OP	30	31.5	645	44.8	21.5
Shigella, OP	1	1.1	7	0.5	7.0
Unknown etiology	6	6.3	49	3.5	8.2
Total	95	100	1439	100	15.1

Conclusions: The obtained results indicate an unfavorable epidemiological AEI situation in Ukraine. The highest rates were reported in the areas adjacent to the Black and Azov Seas and in the areas that are the most populated in Ukraine. AEI caused by other observed agents and AEI of unknown etiology prevail in the AEI incidence structure. Despite of the selectivity of rotaviruses investigation, RVE median incidence is the highest. The AEI situation becomes more complicated with increase in diarrheal infection outbreaks. Every third case of disease outbreak is connected with public food facilities, every fourth is connected with PSI. Most often outbreaks were caused by salmonella and were of mixed outbreak nature. Almost 20 % of all AEI outbreaks were registered in August. The above mentioned shows that epidemiological surveillance of AEI must be improved by developing preventive measures, which would be based on incidence rates in each separate territory, finding the dominant transmission ways and factors, and strengthening the elective care of sanitary and epidemiological authorities for public food facilities and children pre-school institutions.

References

1. World Health Organization. Diarrhoeal disease. Fact sheet N330. - 2013. - Retrieved from http://www.who.int/mediacentre/factsheets/fs330/en/

2. Hu Y, Gui L, Chang J, Liu J, Xu S, Deng C, Yu F, Ma Z, Wang G, Zhang C. The incidence of infants with rotavirus enteritis combined with lactose intolerance. *Pak J Pharm Sci.* 2016 Jan; 29(1 Suppl): 321-3.

3. Malyish NG, Doan SI, Holodilo EV. Nosological structure of acute intestinal infections, endogenous risk factors. *Immunopatologiya, allergologiya, infektologiya.* 2015;3:40-46.

4. Lal A, Baker MG, French NP. The epidemiology of human salmonellosis in New Zealand, 1997- 2008. *Epidemiol Infect.* 2012;140(9):1685–1694.

5. World Health Organization. Salmonella (non-typhoidal). Fact sheet №139 Updated August 2013. – Retrieved from http://www.who.int/mediacentre/factsheets/fs139/en/

6. Jackowska T, Pawlik K. Prevention of nosocomial infections in pediatric ward-own experiences. *Dev Period Med.* 2015; Apr-Jun 19(2): 225-34.

7. Martyinova GP, Bogvilene YaA, Saybel IV, Vaytsel EV. Clinical and epidemiological characteristics of iersiniosis infection in Krasnoyarsk children. *Sibirskoe meditsinskoe obozrenie.* 2012;4(76):64-69.

8. Lebedkova NV. The long-term dynamics of the incidence of intestinal ursiniosis and pseudotuberculosis in the Republic of Belarus for the period from 1996 to 2011.*Meditsinskiy zhurnal.* 2012;31:8-11.

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According to the official statistical reports of the Ministry of Health in Ukraine using descriptive and analytical approaches of epidemiological research

method, epidemic process intensity of acute intestinal infections under the current conditions in Ukraine has been studied. It has been established that an unfavorable epidemiological situation of acute intestinal infection incidence is created. The highest rates were registered in the administrative territories adjacent to the Black and Azov Sea as well as in Kharkiv region. Acute intestinal infections of unknown etiology and caused by viruses and opportunistic pathogens prevail in the nosological structure. Epidemic situation of acute intestinal infections becomes more complicated with cases of outbreaks that are more often caused by salmonella and occur in public food facilities.

Key words: *acute intestinal infections, incidence, salmonellosis, outbreaks.*