Acute diarrheic disease is one of the most frequent problems encountered by pediatricians. In the first 3 years of life, children present between 1 and 3 episodes of acute diarrheic disease with favourable response to the oral rehydration and diet, however existing a percent of 1-4% of the total cases of acute diarrheic disease on age groups.

The aim of the paper was to assess the etiology of the acute diarrheic disease in children. Material and method: We realized a retrospective study on a group of 1229 patients, admitted to Tg-Mures Infectious Disease Clinic I, between 1 January 2008 and 31 December 2009. Results: The most frequent etiology of the acute diarrheic disease in children was the infection with Rotavirus, followed by E.Coli and Salmonella. Conclusions: Acute enterocolitis in babies and in the young children continues to be a problem for the clinician, both due to the large number of demands for this pathology and to the possible problems of diagnosis and treatment this pathology involves.

The following data was selected and processed:
- date of birth and sex of the patient;
- the calendar period when the acute diarrheic disease occurred;
- environment of the patient;
- socio-economic conditions;
- establishing the etiology of the acute diarrheic disease by following the coproculture, the coproparasitological examination, the latex test for rotavirus, and microscopic examination of diarrheal stools for faecal leukocytes.

The study group is made up of 1229 patients with acute diarrheic disease, admitted to Tg-Mures Infectious Disease Clinic I. An observation sheet was issued for each patient, comprising personal data, personal antecedents, anamnestic and clinical data, the results of the laboratory analyses, the antibacterial and antiparasitic treatment.

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We divided the study group of patients according to the urban area (145 in 2008 and 124 in 2009), and 960 patients occurred; 269 patients lived in the environment from which they came – 269 patients lived in the urban area (145 in 2008 and 124 in 2009). It can be observed that there is a slight predominance of males during the two years of the study.

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We divided the study group of patients according to the urban area (145 in 2008 and 124 in 2009), and 960 patients lived in the urban area (145 in 2008 and 124 in 2009), 15 years over a period of 2 years (2008-2009). We tried to analyze the study group, the demographical characteristics, the correlations with the etiologies implied in the infectious pathology, as well as the seasonal variations of the acute diarrheic disease on age groups.

We realized a retrospective study on a group of 1229 patients, who presented acute diarrheic disease episodes,
lived in rural areas (493 in 2008 and 467 in 2009).

From this point of view, there are statistically significant differences as we can observe that ¾ of the total number of patients came from rural areas, this being correlated with the fact that the acute diarrheic disease is more frequently associated with the lack of elementary measures of personal hygiene, being correlated with the absence of sewage and of toilets in the houses. The average period of hospitalization was of 4.2 days, and in the cases with specified etiology it was of 6.1 days. The symptoms recorded at the moment of hospitalization, besides diarrhea, were fever (87%) and vomiting (58%).

Further in the study, we divided the group of patients according to their living conditions, as the socio-economic conditions have an effect on the frequency and severity of this affection. Today, it is considered that there is a direct link between the number and gravity of cases of acute diarrheic disease in children and the level of poverty correlated with a low economic and cultural level. Thus, I observed that from the total of 1229 patients, 835 (68%) of them live in precarious conditions and only a small part, 394 (32%) benefited from adequate living conditions. In the analyzed period of the study, we divided the study group of patients according to their age – the age of the patients hospitalized at Tg-Mures Infectious Disease Clinic 1 ranged between 1 month and 15 years old. The peak incidence of the acute diarrheic disease is around the age of 1 both in the year 2008 and in the year 2009 (230 cases in 2008 and 245 cases in 2009), with a gradual decrease of its frequency as the age increases as it is a well known fact that acute enterocolitis are common with early baby age and with young children’s age. Consequently, there are no statistically significant differences from this point of view.

The study group was also divided from the point of view of the hospitalization period. Generally, the acute diarrheic disease in children is a seasonal disease, predominating in summer months: June, July and August. The results for 2008 were unexpected, as we obtained a peak of cases of the disease in October (80 cases) followed by September (71 cases). In 2009, we obtained an increased incidence of cases in June (76 cases), which is normal because, as we mentioned above, the diarrheic disease is more frequent in this period and yet, a lot of cases were recorded in the months when we would not have expected to occur: October and January (65 cases for each). The next step of our study was to identify the etiological agents of acute enterocolitis during the two years of the study. A significant number of cases could not be identified etiologically, because of the reduced possibilities of our lab, especially in the case of the diarrheic disease of viral etiology.

In 2008, from the total number of 638 patients with acute diarrheic disease, in 81% of the cases (517 patients), the etiology could not be specified and for only 19% of the cases (121 patients), the etiology of the diarrheic disease was specified. From these, 67 patients (10,50%) were diagnosed with Rotavirus, 33 patients (5,17%) with E.Coli, 16 children (5,17%) with Salmonella and 5 children (0,78%) with Shigella. These results allowed us to state the fact that in the case of our study the enteral infection with Rotavirus was the most frequently encountered. This finding is explained by the frequency with which this virus may appear in children with the age between 4 months and 2 years (it is unusual with a newborn as he/she is capable of excreting the virus without presenting any clinical signs of the disease); it is clear that the majority of children with acute diarrheic disease were aged between this interval.

According to this statistical data, we may state that for most of the children diagnosed with acute diarrheic disease, infection with rotavirus was proven in terms of etiology (by agglutination latex test) they frequently being under 1 year old, with a maximum around the age of 1 year (230 cases).

**Figure no. 1 Etiological agents identified in the patients with acute diarrheic disease in 2008**

For the year 2009, the situation is fairly similar with the previous year, so that from the total of 591 patients, in the case of 526 patients (89%) the etiological diagnosis of the acute enterocolitis could not be determined. Instead, in 65 patients (11%), the etiological diagnosis was specified as it follows: in 38 patients (6,425%) the rotavirus was isolated, in 13 of the cases (2,19%) Salmonella, in 8 children (1,35%) E.Coli was identified as etiological agent, and in 2 patients (0,33%) Shigella. Meanwhile, in 2 patients (0,33%), stool cultures positive for Campylobacter were isolated and in other 2 patients, stool cultures positive for Yersinia Enterocolitica. In conclusion, we may argue that, based on laboratory data, for 2009 as well, the rotavirus was isolated in most of the patients (6,42%) as etiological agent.

**Figure no. 2. Etiological agents identified in the patients with acute diarrheic disease in 2009**

From the study, it can be observed that the infection with rotavirus was the enteral infection most frequently encountered during the two years under observation, concordantly with the data of literature, in which it is specified that approximately 80% of the children will suffer at least one episode of rotavirus diarrhoea before the age of 5. This fact represents the reason for which in the USA, there will be 410,000 consultations per year, 250,000 emergency calls and around 60,000 hospitalizations, all due to the rotavirus. In 2008, the CDC published a report linked to the impact of antirotoviral vaccination on the seasonal evolution of the virus which demonstrated a decreased incidence of consultations for viral diarrhoea with more than 50%.

Taking into consideration that the rotaviruses constitute the most frequent cause of acute viral diarrhoea in children aged between 6 months and 3 years, a correlation of the cases with the age of the occurrence of the disease was intended.

In the 1 year old child, the maximum incidence of the enteral infection with rotavirus was around the age of 6 months; both for the year 2008 and 2009.
CLINICAL ASPECTS

Most of the cases of infection with rotavirus were around the age of 1-3 years, both for the year 2008 (7.68%) and for the year 2009 (4.73%), being known that over 5 years, there are only subclinical infections.

The diagnosis of gastroenteritis with rotavirus is based on the identification of viral particles in the faecal matter. These particles, released in a great number during the infection, may be observed with electronic microscopic techniques (ME) or may be detected by immunological methods. For detecting the rotavirus, in the laboratory within the Infectious Disease Clinic 1, the Agglutination Latex technique was used. This method is less sensitive than electronic microscopy or the ELISA methods, it has the advantage of being an easy method which can be performed without any special equipment, and the results are available in less than 5 minutes (6).

The results obtained revealed that the most frequent germs involved in the bacterial etiology of the acute enterocolitis with the children admitted to the Infectious Disease Clinic 1 from Târgu-Mureș between 2008 and 2009 were Salmonella and E.Coli. This is similar to the data of existent literature which accounts for Salmonella in many studies, but also Shigella, as the most frequent etiological agents involved in the child’s enterocolitis.

A study performed in the USA, at the Cincinnati Children Hospital Medical Centre in 2003, which took into account 2884 stool cultures, revealed that Salmonella represented the most frequently isolated germ in children’s stool cultures (approximately 50% of the cases) followed by Shigella (approximately 40% of the cases), and Campylobacter, whose isolation is extremely laborious and very expensive, a reason for which in the majority of the labs in our country, its determination is minimal.(7)

In the USA, Salmonella causes between 1 and 5 million cases of enterocolitis of children. The major risk of the disease is present with infants, and the incidence of the symptomatic infection is reduced with children over 6 years.(7)

The infection with Shigella has a global distribution and appears more frequently in the warm season, in the region with a temperate climate and in the rainy season in the regions with tropical climate. It affects equally both sexes and though it may appear at any age, it predominates in children aged between 2 and 3. The infection in the first 6 months is rare; it occurs due to the absence of receptors for the Shiga toxin at that age.(3,7)

In the past, it was believed that the enterocolitis with Yersinia appeared in the countries with cold climate, but today the global distribution of this microorganism is recognized. It has an incidence of 1 case in 100,000 in the USA, its incidence being slightly higher in the North of Europe. The disease appears more frequently in the cold season in young males.(2)

Regarding the cases of acute enterocolitis with E.Coli, it can be observed that they represent a total of 41 cases, respectively 3.3% of the total positive faeces cultures, a fact which may be explained by the reduced attention given to this enteropathogen and by the difficulties of isolation and identification. In the future, it must be investigated with greater attention the implication of this enteropathogen in the etiology of the child’s acute enterocolitis, as the acute enterocolitis with enteropathogen E.Coli (EPEC) is a major cause of diarrhea in the developing countries, 30-40% of the cases of enterocolitis, especially in babies under 6 months, being produced by EPEC. The incidence of acute enterocolitis with EPEC seems to be underestimated because of the difficulties of the serotyping. In our study, most of the cases of diarrheic disease with E.Coli were in patients aged between 1 and 3 years, in the year 2008 a percent of 3.13% as compared to 2009, when it was 1.18%; and no patients over 6 years were diagnosed with enteral infection with E.Coli.(8)

As far as the gastroenterocolitis with Salmonella is concerned, it is frequent under the age of 5 and children with this diagnosis present fever, nausea and watery diarrhoea. It may be observed from the lower analyses that with patients of an age between 1 and 3 years, the infections with salmonellas predominates, in 2008 11 patients being diagnosed (1,72%) and in 2009, 13 cases.

From a paraclinical point of view, the stool culture represents the main means of establishing the etiology in the case of enterobacteriaceae (Salmonella, Shigella, E.Coli). In many labs, the analysis is most of the times negative, in spite of the “bacterial” aspect of the diarrhea. There are many arguments explaining this “paradoxical” situation, among these arguments being the start of the antibiotic treatment before getting the stool culture, “delay on the way” or in the lab of the pathologic product before insemination, etc. Another problem refers to the long period of time needed for the growth and identification of the germ by the classical microbiological methods (2-3 days), followed by another period for getting the antibiogram, which makes the positive result of a stool culture to arrive much later, when it is ineffective from the practical point of view and is valuable more for epidemiological reasons regarding the sequence of cases in a community.(9) Another reason for which the stool culture remains negative would be the etiology of the Acute Diarrheic Disease (especially in babies).

The microscopy for fecal cells represents the laboratory examination by which the leukocytes on the microscopic field are numbered, allowing appreciating the content of the stool, respectively, the presence of undigested food particles. A small quantity of stool is mixed with 1-2 drops of methylene blue (Löffler environment), then it is examined under the microscope. The presence of more than 10 leukocytes on the microscopic field orients the diagnosis towards the enterotoxigenic form of acute diarrhoea, while the absence of these pleads for the enterotoxigenic form. The neutrophile leukocytes in the faecal matter, in a feverish diarrhoea, certifies the presence of invasive bacteria which provoked the diarrhoea (Shigella, Salmonella, invasive E.Coli, Yersinia), and their absence confirms a viral, toxic or parasitary diarrhoea.

The intestinal parasitoses are affections which are frequently encountered in children, irrespective of age. In the

Table no. 1. The distribution of the cases of E. Coli according to age

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of cases in 2008</th>
<th>No. of cases in 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>1-3 years</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>3-6 years</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>6 years</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure no. 3. Etiological agents isolated from stool cultures

The microscopy for fecal cells represents the laboratory examination by which the leukocytes on the microscopic field are numbered, allowing appreciating the content of the stool, respectively, the presence of undigested food particles. A small quantity of stool is mixed with 1-2 drops of methylene blue (Löffler environment), then it is examined under the microscope. The presence of more than 10 leukocytes on the microscopic field orients the diagnosis towards the enterotoxigenic form of acute diarrhoea, while the absence of these pleads for the enterotoxigenic form. The neutrophile leukocytes in the faecal matter, in a feverish diarrhoea, certifies the presence of invasive bacteria which provoked the diarrhoea (Shigella, Salmonella, invasive E.Coli, Yersinia), and their absence confirms a viral, toxic or parasitary diarrhoea.

The intestinal parasitoses are affections which are frequently encountered in children, irrespective of age. In the
breastfed baby, there is a low incidence of parasitoses as he/she does not have the possibility of getting contaminated directly. The symptomatology of intestinal parasitoses overlaps most of the time the clinical symptoms of acute bacterial or viral diarrheic disease, such as diarrhoea, nausea, vomiting, bloating, acute abdominal pain, sleepiness, loss of weight and a stop in the growth of the child. After an episode of intestinal parasitoses, there is no total immunity, and the patient may be reinfested at any moment.(3)

Some of the monitored patients during the study presented parasitoses associated to the acute diarrheic disease, an increased number being recorded in 2008, 56 cases, comparatively with 25 cases in 2009. The most frequent cases were the infection of Giardia lamblia, Hymenolepsis nana and Ascaris lumbricoides.

Figure no. 4. Intestinal parasitoses associated with acute diarrheic disease

CONCLUSIONS

1. The diarrheic disease in babies and young children continues to be a problem for the clinician, both because of the high number of demands for this pathology, and because of the possible diagnosis and treatment issues it involves.

2. Taking into consideration the high number of etiologies which are not elucidated, it is necessary to improve the accuracy of bacteriological results obtained through the increase of performance of determinations in the microbiology lab.

3. The analysis of the hospitalized cases during the study was not correlated with an increase in the incidence of the acute diarrheic disease in the spring – summer season (the April – September period).

4. The majority of cases of the acute diarrheic disease appeared with children under the age of 1 year and who came from rural areas.

5. The gastroenteritis caused by rotavirus remains the most frequent affection with the young children (1-3 age group).

6. Escherichia Coli and Salmonella represent the most frequently encountered germs involved in the etiology of bacterial enterocolitis of the child (1-3 age group).

7. The prophylaxis by vaccination for the rotavirus will determine a decrease in the number of hospitalizations and consultations in children with acute diarrheic disease.

8. The intestinal parasitosis frequently associated to acute diarrheic disease at the hospitalized children was Giardia lamblia in both years of the study.

REFERENCES


