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Associated diseases in rotavirus gastroenteritis in children hospitalized in Clinical Infectious Diseases Hospital of Constanta

Simona Diaconu[1], Simona Claudia Cambrea[1,2], Lucian Cristian Petcu[2], Sorin Rugina[1,2]

[1]Clinical Hospital of Infectious Diseases, Constanta, Romania
[2]Ovidius University, Constanta, Romania

ABSTRACT

Our study included 505 children hospitalized in the Clinical Hospital of Infectious Diseases Constanta in 2011-2012 with gastroenteritis with rotavirus. We analyzed the medical records of the patients and extracted demographic data, temperature, and frequency of vomiting and diarrheic stools. We divided the group of cases into 4 groups associated with: respiratory disease (RD) – 160 cases, digestive disease (DD) – 52 cases, eruptive disease (ED) – 11 cases, and a group without other associated diseases (simple) – 282 cases. We found significant differences between the four groups regarding the number of stools, the number of vomiting per day, the mean value of maximum temperature, the mean value of hospitalization.

Keywords: rotavirus, gastroenteritis, associated diseases

INTRODUCTION

Rotavirus is the most common cause of severe gastroenteritis in infants and young children worldwide. The clinical spectrum of rotavirus illness ranges from mild, watery diarrhea of limited duration to severe diarrhea with vomiting and fever that can result in dehydration with shock and electrolyte imbalance. Following an incubation period of 1-3 days, the illness often begins abruptly, and vomiting often precedes the onset of diarrhea. Gastrointestinal symptoms generally resolve in 3-7 days. Rotaviruses are shed in high concentrations in the stools of infected children and are transmitted primarily by the fecal-oral route, both through close person-to-person contact (1). Rotaviruses also are probably transmitted by other modes, such as fecally contaminated food and water or by respiratory droplets (2). Rotavirus is highly communicable, with a small infectious dose of < 100 virus particles (3).

OBJECTIVE

To evaluate if there are any difference regarding temperature, frequency of vomiting and diarrheic stools between four groups of patients with rotavirus gastroenteritis associated with respiratory disease, with digestive disease, with eruptive disease and the group without other associated diseases.

MATERIAL AND METHOD

The experimental data was processed using the IBM SPSS Statistics 20 Statistical Processing Program. The procedures used were: descriptive statistics (for the characterization of discrete and continuous variables defined at the database level); charts and parametric statistical tests (One-Way ANOVA unifactorial analysis completed by the Post Hoc – multiple comparisons Bonferroni/Tamhane analysis). It was considered statistically significant $p < \alpha = 0.05$.

Corresponding author:
Assoc. Prof. Simona Claudia Cambrea, MD, PhD
E-mail: cambrea.claudia@gmail.com

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For the processing and interpretation of the data for scientific purposes, the informed consent of the children's parents at the admission in hospital was obtained, as well as the opinion of the Ethics Committee of the Constanta Clinical Hospital of Infectious Diseases.

RESULTS AND DISCUSSIONS

Our study included 505 children with rotavirus gastroenteritis (RGE), hospitalized in the Clinical Infectious Diseases Hospital of Constanta in years 2011-2012. We analyzed the medical records of the patients and we extracted demographic data, temperature, and frequency of vomiting and diarrheic stools.

We divided the studied group into other 4 subgroups: first group with associated respiratory disease (RD) – 160 cases; second group with associated digestive disease (DD) – 52 cases; third group associated with eruptive disease (ED) – 11 cases; and the fourth group of patients who presented just rotavirus gastroenteritis – RGE – (Simple) – 282 cases (Fig. 1).

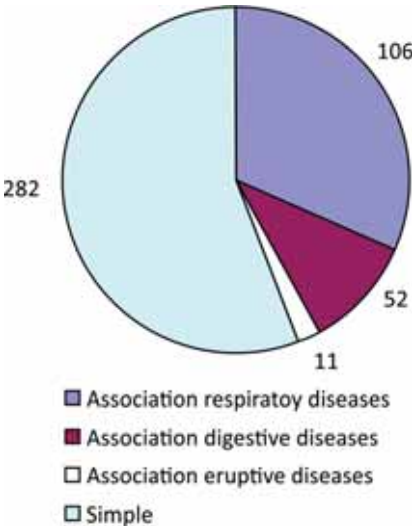

FIGURE 1. *Repartition by studied groups*

In group one RD associated with RGE were: pneumonia – 35, tonsillitis – 72, acute upper respiratory infection-53. In group 2 DD associated with RGE were: enterocolitis with Escherichia coli – 21 cases, enterocolitis with Salmonella – 3 cases, enterocolitis with Shigella – 8 cases, enterocolitis with Pseudomonas aeruginosa – 11 cases, enterocolitis with Klebsiella– 10 cases; acute viral hepatitis – 1 case. ED associated with RGE were: measles – 3 cases, rubella – 1 case, chickenpox – 3 cases, scarlet fever – 4 cases.

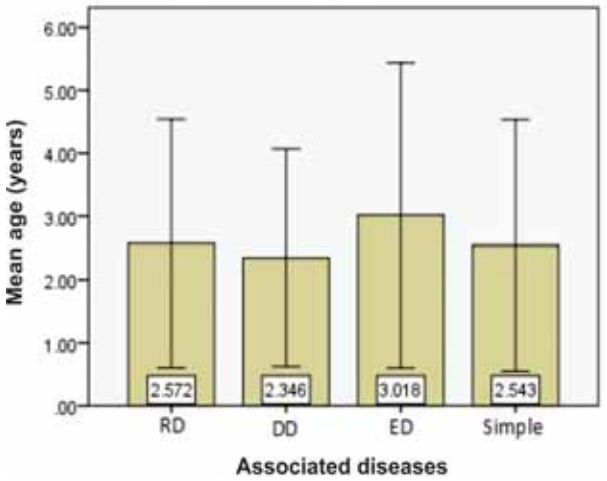

FIGURE 2. *Mean age (years) for the four studied groups*

The mean value of age (Fig. 2) of the four groups were: M_{RD} = 2.57 years, M_{DD} = 2.34 years, M_{ED}= 3.01 years, M_{Simple}= 2.54 years; do not differ significantly (F = 0.398; p = 0.754> α = 0.05).

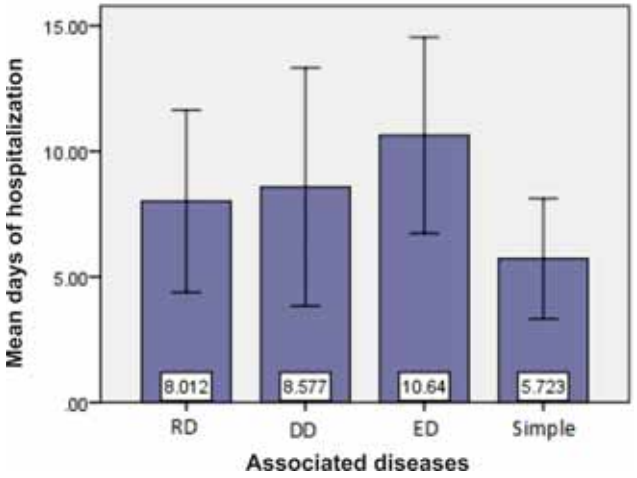

FIGURE 3. *Mean value for hospitalization days*

One-Way ANOVA unifactorial analysis applied to compare mean days of hospitalization values corresponding to the four groups (M_{RD} = 8.01 days, M_{DD} = 8.57 days, M_{ED} = 10.64 days, M_{simple} = 5.72 days) demonstrated significant statistical differences among these values (F = 29.57; p = 0.001 <α = 0.05). This result is also confirmed by the Post Hoc – multiple comparisons / Tamhane analysis (Leven Statistic = 14.68, df_1 = 3, df_2 = 501, p = 0.001 < α = 0.05 for test of homogeneity of variances) which confirms that there are significant differences between groups RD – Simple (p = 0.001),

ED – Simple (p = 0.001), DD – Simple (p = 0.001) (Fig. 3).

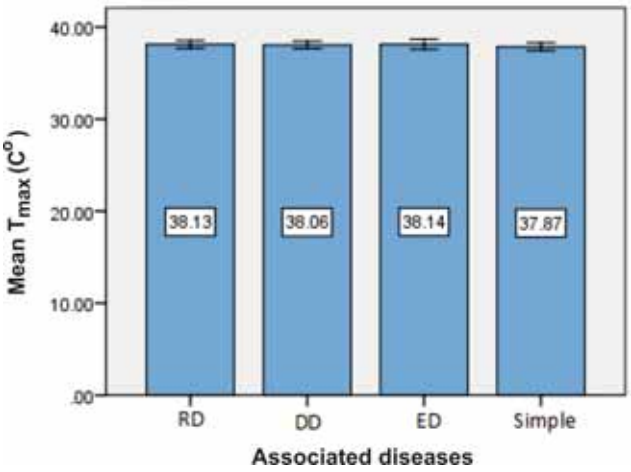

FIGURE 4. *Mean value of maximum temperature (Celsius degrees)*

When we compare, by Anova unifactorial analysis, the mean maximum temperature (Tmax) values for the four groups (M_{RD} = 38.13°C, M_{DD} = 38.06°C, M_{ED} = 38.14°C, M_{Simple} = 37.87°C), as can be seen in Fig. 4, we found that differences were significantly for at least two of the groups studied (F = 13.63; p=0.001 < α = 0.05). From the results of Post-Hoc multiple comparisons/ Bonfferoni analysis (Leven Statistic = 2.009, df_1 = 3, df_2 = 501, p = 0.112 > α = 0.05) there are differences between the group next groups: RD – Simple (p=0.001) and DD – Simple (p=0.0021).

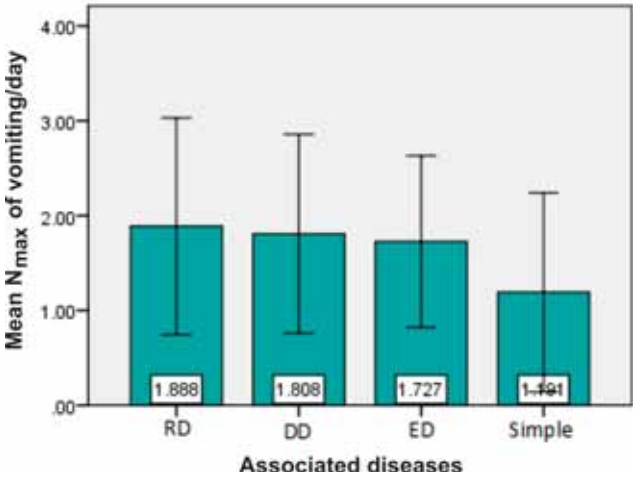

FIGURE 5. *Mean value of maximum number of vomiting/ day*

We compared also the mean values of the number of vomits per day (Fig. 5) for the four groups (M_{RD} = 1.8875 vomiting/day, M_{DD} = 1.8077 vomiting/day, M_{ED} = 1.7273 vomiting/day, M_{Simple} = 1.1915 vomiting/day) by using ANOVA unifactorial analysis and we found significantly difference: (F = 16.15, p = 0.001 <α = 0.005). From the results of the Post-Hoc /Tamhane analysis (Levene Statistic = 0.2; df_1 = 3, df_2 = 501, p = 0.896> α = 0.005), there are significant differences between the groups: RD – Simple (p = 0.001) and DD – Simple (p = 0.001).

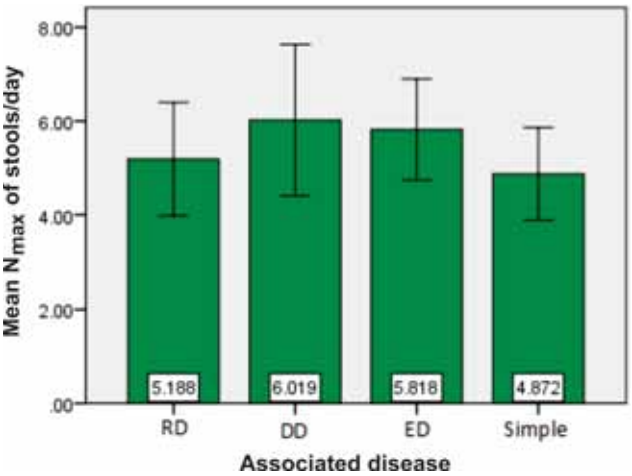

FIGURE 6. *Mean value of maximum number of stools/day*

The mean values of the maximum number of diarrheal stools per day (Fig. 6) in the four groups (M_{RD} = 5.1875, M_{DD} = 6.01, M_{ED} = 5.81, M_{Simple} = 4.87) are significantly different according with ANOVA unifactorial analysis (F = 16.73; p = 0.01 <α = 0.05). From the results of Post-Hoc Tamhane analysis (Levene Statistic = 5.763; df_1 = 3, df_2 = 501, p = 0.001 <α = 0.05), there are differences between DD – Simple group (p = 0.001).

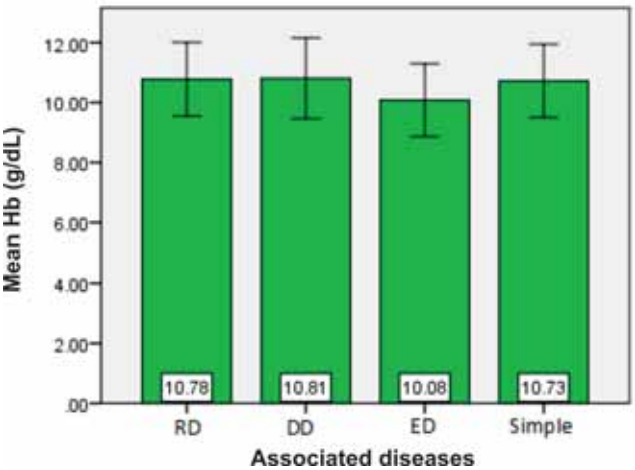

FIGURE 7. *Mean value of Hb (g/dL)*

By analyzing the mean values of Hb (Fig. 7), with ANOVA, in the four groups (M_{RD} = 10.77 g/

dL, M_{DD} = 10.81 g/dL, M_{ED} = 10.08 g/dL, M_{Simple} = 10.72 g/dL) we found that there were no significant differences between them (F = 1,155; p = 0,326 <α = 0.05).

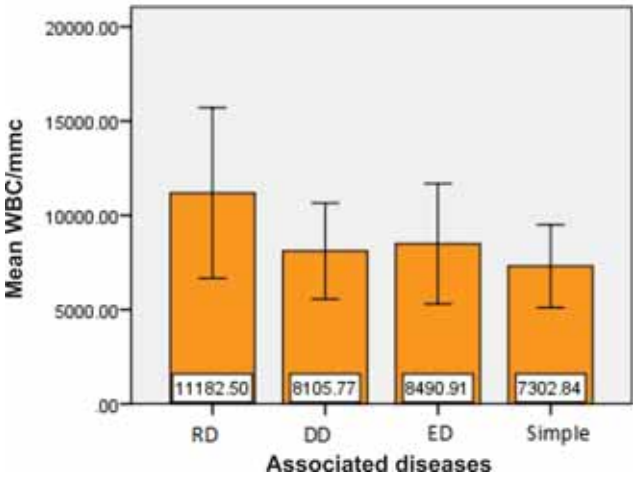

FIGURE 8. *Mean value of WBC/mmc*

The mean value of WBC/mmc in the studied groups were presented in Fig. 8. Results of ANOVA unifactorial analysis regarding mean value of WBC in four groups (M_{RD} = 11,182.5; M_{DD} = 8,105.77; M_{ED} = 8,490.91; M_{simple} = 7,302.84) demonstrated significantly difference among these values (F = 51.559; p = 0.001 <α = 0.05). From the results of the Post-Hoc Tamhane analysis (Levene Statistic = 54.35; df_1 = 3, df_2 = 501, p = 0.001), there are differences between the next groups: RD – DD (p = 0.001), RD – Simple (p=0.001), RD – ED (p = 0.004).

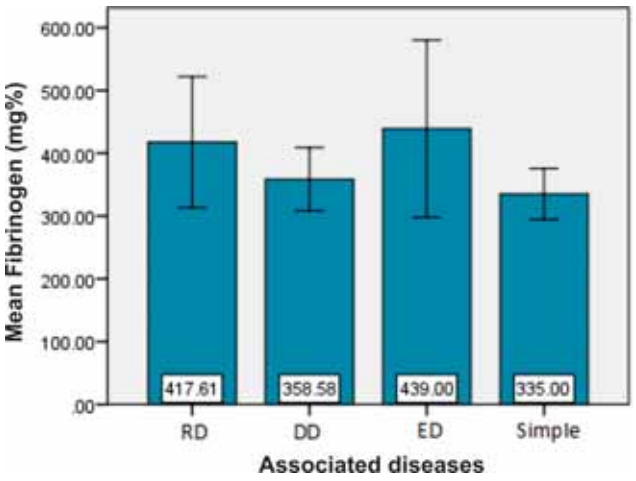

FIGURE 9. *Mean value of fibrinogen (mg%)*

According with ANOVA unifactorial analysis, mean values of fibrinogen (Fig. 9) in the four studied groups (M_{RD} = 417.61 mg%, M_{DD} = 358.58 mg%, M_{ED} = 439 mg%, M_{simple} = 335 mg%) are significantly different between them (F = 50.11; p = 0.001 <α = 0.05). From the results of Post-Hoc analysis (Levene Statistic = 65.77; df_1 = 3; df_2 = 501; p = 0.001 <α = 0.05), there are significant differences between the groups compared: RD – DD (p = 0.001), DD – Simple (p = 0.013), ED – Simple (p = 0.001), DD – ED (p = 0.004).

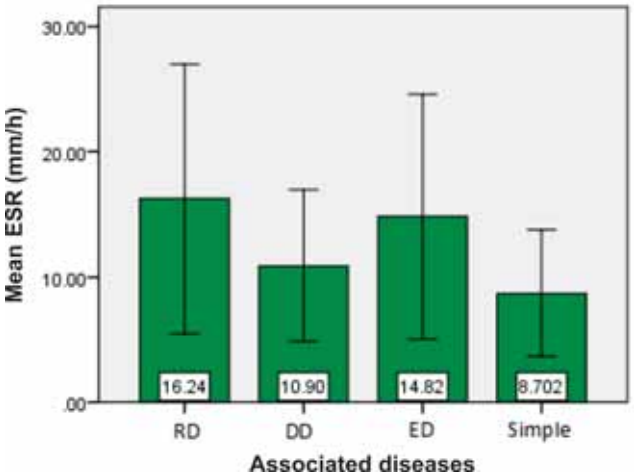

FIGURE 10. *Mean value of ESR (mm/h)*

The mean value of erithrocyte sedimentation rate (ESR) measured in mm/1 h (Fig. 10), of the four groups (M_{RD} = 16.24 mm/1 h, M_{DD} = 10.9 mm/1 h, M_{ED} = 14.81 mm/1 h, M_{Simple} = 8.7 mm/1 h) analysed by ANOVA unifactorial demonstrated significantly difference between groups (F = 35.08; p = 0.001 <α = 0.005). From the results of the Post-Hoc analysis (Levene Statistics = 46.71; df_1 = 3, df_2 = 501, p = 0.001), there are significant differences between next groups compared: RD – DD (p = 0.001), RD – Simple (p = 0.001).

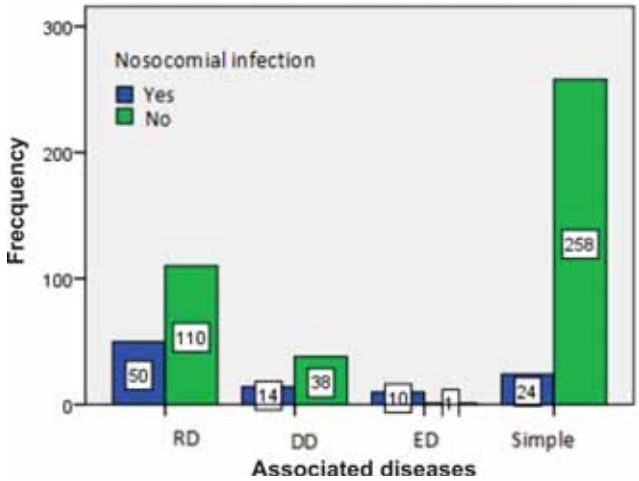

FIGURE 11. *Associated disease in Nosocomial Rotavirus Gastroenteritis*

It is known that rotavirus is an important cause of nosocomial gastroenteritis (4). In our study nosocomial infections with rotavirus were noticed in 50 of the 160 cases from the group one with associated respiratory diseases, 14 in the group two with associated digestive diseases, 10 in the group three with associated eruptive diseases and 24 cases in group 4 without any associated disease (Fig. 11).

Severe, dehydrating in rotavirus infection occurs primarily among unvaccinated children aged 3-35 months. All the children included in our study were not vaccinated for rotavirus. The mean age in four studied groups of patients with RGE varies from 2.34 yrs to 3.01 yrs, which is comparative with age of patients with RGE from other international studies (4,5,6,7,8). Children who are immunocompromised sometimes experience severe, prolonged and even fatal RGE (2,9,10), but in our study we didn't noticed any case.

Our study evidence that between the four groups, regarding the average age (p=0.754), sex (p=0.242), and home environment (p=0.466), we didn't find any differences. Regarding the average hospitalization days, this study evidenced that there are significant differences between the group of patients just with RGE and all three other groups of RGE associated with RD, DD, ED.

When we compare the average maximum temperature between 4 studied gropus, we found that there are differences between the group of simple RGE and groups of patients with RGE associated with RD and DD.

When we take into consideration the number of vomits per day, there were differences between RGE group (Simple) and the groups of patients with RGE associated with RD and DD (p=0.001). Regarding the number of stools per day, the group of those in association with digestive diseases presented the highest number per day (p=0.001).

The value of fibrinogen and ESR significantly differs between four groups of studied patients, but the mean Hb level was approximately equal in all groups. The mean white blood cell count/mmc differs between groups of RGE associated with other diseases, RD having the highest values.

CONCLUSIONS

We found that the highest number of vomits per day were in groups of patients with RGE associated with RD and DD; and the highest number of diarrheic stools were found in group of patients with RGE associated with DD.

In the groups of patients with RGE associated with other diseases (RD, DD, ED) we found an increased numbers of hospitalisations days comparative with group of RGE without any other disease.

Conflict of interest: none declared
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