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COMPARATIVE ASSESSMENT OF THE EFFECTIVENESS OF PROBIOTICS IN THE TREATMENT OF DIARRHEA IN CHILDREN WITH HIV

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Abstract: The addition of various probiotics to the complex treatment of acute diarrhea in children with HIV significantly affects the daily frequency and duration of diarrhea, pathological impurities in feces and their consistency. (P<0.05). In cases of acute diarrhea, especially in children with a weakened immune system, it is advisable to include highly effective probiotics such as Lactobacillus rhamnosus or Saccharomyces boulardii in the complex treatment. Bifidobacterium bifidum can be used as an adjuvant in mild cases, depending on the need.

Keywords: HIV infection, children, diarrhea, probiotics

Objective: To conduct a comparative evaluation of the effectiveness of various probiotics in the treatment of diarrhea in children with HIV.

Research materials and methods. The study was conducted in 2020-2025 at the Specialized Infectious Diseases Clinic under the Republican Center for Combating AIDS, the Department of HIV Infection of the Research Institute of Virology under the Scientific and Practical Medical Center for Epidemiology, Microbiology, Infectious and Parasitic Diseases of the Ministry of Health of the Republic of Uzbekistan, based on the examination of 499 children aged 3 to 18 years with acute diarrhea associated with HIV infection. The children were divided into two groups and studied: group 1 consisted of 261 HIV-infected children with acute diarrhea of an infectious nature, group 2 consisted of 247 children with acute diarrhea without HIV infection. Children were diagnosed with "HIV infection" based on the order of the Ministry of Health of the Republic of Uzbekistan dated August 19, 2023 No. 270 "On protocols for the prevention and treatment of human immunodeficiency virus infection" and No. 122 dated March 25, 2015 "On improving measures against dysentery, paratyphoid, salmonellosis and acute intestinal diseases among the population of the republic."

The criteria for determining the severity of acute diarrhea in children with HIV infection are the daily number of diarrhea episodes, duration of diarrhea, stool volume, consistency, presence of pathological impurities, degree of dehydration, signs of intoxication.

In order to treat dysbiotic changes detected in children with HIV infection with acute infectious diarrhea, we used several probiotics in the complex treatment plan for comparative adjustment. Of these, the combined drug Metaflora containing Lactobacillus rhamnosus, Bifidobacterium infantis, Lactobacillus acidophilus, Bifidobacterium breve, Streptococcus thermophilus, Lactobacillus casei, Lactobacillus bulgaricus; Saccharomyces boulardii (Enterol), Bacillus cereus (Bactrimsubtil), Bacillus clausii (Enterogermina) and Bifidobacterium bifidum were administered 1 capsule 2 times a day for 5 days.

Results of the study and their discussion. The frequency of diarrhea 3-5 times a day was observed in 10.5% of children in the main group and 11.5% of those in the comparison group before treatment, with an average of 4.8±0.1 times a day in both groups, respectively. After taking Lactobacillus rhamnosus along with complex treatment, this indicator significantly increased to 85.7% in children in the main group and to 96.3% in the comparison group, with an average of

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3.5±0.1 and 3.1±0.07 times a day, respectively. Diarrhea 6-9 times a day was observed in more than half of the patients in both groups before treatment (54.5% and 58.5% of cases, respectively), with an average of 8.6±0.08 times a day, respectively, after treatment with Lactobacillus rhamnosus, it significantly decreased by 3.8 times compared to the pre-treatment index in the main group, with an average of 6.2±0.5 per day, and remained in only one (3.7%) patient in the control group, with 6 times ($P<0.05$). The frequency of diarrhea more than 10 times a day in HIV-infected children before treatment was 13.9±0.3 times a day, respectively. After this course of treatment, diarrhea more than 10 times a day was not observed.

After the use of the drug Saccharomyces boulardi, the daily frequency of diarrhea increased significantly in 78.1% of the main group and 94.7% of the comparison group, with an average of 3.8±0.2 and 3.3±0.1 times per day, respectively. The daily frequency of diarrhea decreased significantly by 2.5 times in the main group compared to the pre-treatment indicators, while this indicator was observed in only 2 children (4.2%) in the comparison group, with an average of 6.7±0.3 and 6.5±0.5 times per day, respectively ($P<0.05$). The use of Saccharomyces boulardi in the complex treatment of acute diarrhea eliminated the frequency of diarrhea exceeding 10 times per day.

The inclusion of Bacillus clausii in the complex treatment of acute diarrhea led to a decrease in the number of daily diarrhea episodes to 3-5 in 70.8% of children in the main group and 85.7% of those in the control group, with an average of 4.1±0.2 and 3.6±0.1 times per day, respectively. The number of daily diarrhea episodes to 6-9 was significantly reduced by 1.8 times in the main group and 4.1 times in the control group compared to pre-treatment values, with an average of 7.3±0.3 and 6.6±0.2 times per day, respectively ($P<0.05$). After this course of treatment, the number of daily diarrhea episodes exceeding 10 times was not detected in children in either group.

The addition of Bacillus cereus to the treatment regimen for acute diarrhea in HIV-infected children significantly increased the number of daily diarrhea episodes up to 3-5 times compared to pre-treatment values by almost 6.3 times and by 6.7 times in the control group, with an average of 4.4±0.1 and 3.8±0.1 times per day, respectively. The significant differences between pre-treatment and post-treatment values for the number of daily diarrhea episodes up to 6-9 times were 1.6 times lower in the main group and 2.6 times lower in the control group, with an average of 7.7±0.3 and 6.9±0.3 times per day, respectively ($P<0.05$). After this course of treatment, diarrhea episodes exceeding 10 times per day were not detected in children in either group.

The effect of the drug Bifidobacterium bifidum on reducing the number of daily diarrhea episodes to 3-5 times was significantly higher in the main group of children than in the control group, with an average of 4.8±0.1 and 4.1±0.1 times per day, respectively. The significant differences between the indicators of the number of daily diarrhea episodes to 6-9 times before and after treatment were 1.6 times less in the main group and 2.1 times less in the control group, with an average of 8.1±0.2 and 7.5±0.3 times per day, respectively ($P<0.05$). After the use of the drug Bifidobacterium bifidum, the frequency of diarrhea more than 10 times a day remained in 2 children in the main group (5.7%), an average of 14.5±1.1 times a day, and in one child in the control group (1.8%), an average of 11 times.

Before treatment, diarrhea lasted 1-3 days in 1/3 of children in both groups, on average 2.9±0.04 days, respectively. The inclusion of Lactobacillus rhamnosus in the complex treatment regimen resulted in diarrhea lasting 1-3 days in 96.4% of children in the main group and in all

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children in the comparison group, on average 1.8±0.2 days and 1.5±0.1 days, respectively (P<0.05). Before treatment, diarrhea lasted 4-9 days in more than half of patients in both groups, on average 8.1±0.1 days. After treatment, only one child in the main group (3.6%) had diarrhea lasting 4 days. Diarrhea lasting 10-14 days was observed in 11.7% of patients in the main group and 8.5% of children in the comparison group before treatment, with an average duration of 13.1±0.2 days, with an average duration of 10-14 days. When taking the drug Lactobacillus rhamnosus, diarrhea lasting 10-14 days was not observed in either group. After taking Saccharomyces boulardii, the duration of diarrhea in 90.6% of children in the main group and in 97.4% of children in the comparison group was 1-3 days, with an average of 2.0±0.1 days and 1.7±0.1 days (P<0.05). The duration of diarrhea for 4-9 days after the introduction of this probiotic drug decreased by 6.0 times in the main groups, averaging 5.7±0.9 days, while in one child (2.1%) of the comparison group this indicator remained and lasted 5 days (P<0.05). The duration of diarrhea for 10-14 days was not observed in either group when taking the drug Saccharomyces boulardii.

After the introduction of Bacillus clausii into the treatment regimen, the duration of diarrhea for 1-3 days in children in both groups significantly increased by almost 2.6 times compared to pre-treatment values, with an average duration of 2.2±0.2 days in the main group and 1.9±0.1 days in the control group (P<0.05). The difference between pre-treatment and post-treatment values for the duration of diarrhea for 4-9 days was 3.7 times less in the main group and 6.7 times less in the control group, with an average duration of 6.0±0.4 days and 5.3±0.1 days, respectively (P<0.05). The duration of diarrhea for 10-14 days was not observed in either group when taking this drug.

The duration of diarrhea for 1-3 days after taking the drug Bacillus cereus was observed in 73.1% of children in the main group and in 86.7% of the comparison groups, with an average of 2.4±0.2 days and 2.1±0.07 days, respectively. After the introduction of the drug Bacillus cereus into the treatment course, the duration of diarrhea for 4-9 days significantly decreased by 2.1 times in the main group and by 4.3 times in the comparison group, with an average duration of 6.4±0.4 days and 5.8±0.6 days. The duration of diarrhea for 10-14 days was not observed in either group when taking this drug.

After taking the drug Bifidobacterium bifidum for the complex treatment of diarrhea, the duration of diarrhea for 1-3 days significantly increased by almost 2.0 times compared to the pre-treatment values and by 2.2 times in the control group, averaging 2.5±0.3 days and 2.3±0.08 days, respectively. When using this probiotic drug, the significant differences between the pre-treatment and post-treatment values for the duration of diarrhea for 4-9 days were 1.6 times less in the main groups and 2.4 times less in the control group? averaging 7.1±0.3 days and 6.5±0.3 days, respectively. After taking the drug Bifidobacterium bifidum, only one child (2.9%) in the main group had diarrhea lasting 11 days, while in the control group, diarrhea did not last more than 10 days. We know that any diarrhea is characterized by the appearance of pathological impurities in the feces. Before treatment, mucus was detected in the feces of all children in both groups, blood in a quarter, and pus in almost half. After taking Lactobacillus rhamnosus for a complex treatment of diarrhea, mucus in the feces remained in 7.1% of children in the main group and only in one (3.7%) in the control group, and blood and pus were completely eliminated.

After taking Saccharomyces boulardii, mucus in the feces of children in the main group remained in 12.5% of children and in almost 5.3% of those in the control group, and blood and pus were completely eliminated after treatment.

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After taking Bacillus clausii probiotics, mucus in the feces remained in 16.7% of children in the main group and in 8.6% of children in the control group. The presence of blood in the stool disappeared in both groups after treatment. Only one child (4.2%) in the main group had pus in the stool, while in the comparison group, pus disappeared after treatment.

After taking the drug Bacillus cereus, mucus in the stool remained in 19.2% of patients in the main group and in 11.1% of those in the comparison group. Blood in the stool was observed in one child (3.8%) in the main group after the course of treatment, while this indicator was not detected in the comparison group. After the combined treatment with probiotics, pus was detected in 2 children (7.7%) in the main group and in one (2.2%) in the comparison group.

After complex treatment of diarrhea with Bifidobacterium bifidum, pus was detected in the feces of patients in the main group in a quarter of cases and in 1/5 of patients in the comparison group, while blood in the feces remained in 3 patients (8.6%) in the main group and in one patient in the comparison group. The significant differences between the pre- and post-treatment indicators in terms of pus detection were 3.6 times less frequent in the main group and 8.7 times less frequent in the comparison group ($P<0.05$).

Another indicator of the effectiveness of diarrhea treatment is stool consistency, which in patients with diarrhea can be watery, liquid, and pasty. In 43.4% of children with acute diarrhea with HIV infection and 42.0% in the control group, stool was watery before treatment, in almost half of children in both groups it was liquid, and only in 6.9% of the main group and 8% of the control group the stool was pasty.

The addition of Lactobacillus rhamnosus to the complex treatment of diarrhea had a positive effect on the consistency of the stool in 82.1% of the main group and 92.6% of the control group, that is, the stool became solid. Stool retention in a porridge-like consistency was observed in 17.9% of children in the main group and only in one (7.4%) in the comparison group. After treatment, stools of watery and liquid consistency were not observed in both groups of patients.

After taking Saccharomyces boulardii, 78.1% of children in the main group and 89.5% of those in the control group had a hard, formed stool, while 21.9% of patients in the main group and 10.5% of those in the control group had a soft, formed stool. After treatment, watery and liquid stools were not observed in patients in either group. After taking the probiotic Bacillus clausii to restore the balance of intestinal microflora, 66.7% of children in the main group and 82.9% of children in the control group had a hard, formed stool. The significant differences between the pre- and post-treatment indicators for soft stool were 4.2 times less in the main group and 2.9 times less in the control group. Only one child in the main group (4.2%) had a liquid stool after treatment, while this indicator was not observed in the children in the comparison group. After treatment, watery stool was not observed in patients in either group. After treatment, 57.7% of children in the main group and 77.8% of children in the comparison group received the drug Bacillus cereus to improve the intestinal microflora and eliminate diarrheal syndrome. After treatment, 34.6% of children in the main group and 1/5 of children in the comparison group had a solid stool. After treatment, 5.6 times less liquid stool was observed in the patients in the main group, while only one (2.2%) patient in the comparison group remained. After treatment, stools of watery consistency were not observed in both groups of patients.

After complex treatment of diarrhea with Bifidobacterium bifidum, almost half of the patients in the main group (51.4%) and 69.1% of the comparison group had a hard, formed stool.

After this probiotic, the stool remained of a porridge-like consistency in 37.1% of the main group, while in the comparison group this indicator significantly decreased by almost 2 times. After treatment, the consistency of the stool significantly decreased by 3.8 times in the patients in the main group and by 7.8 times in the children in the comparison group. After treatment, watery stool was not observed in patients in either group.

Conclusions:

1. The addition of various probiotics to the complex treatment of acute diarrhea in children with HIV significantly affects the daily frequency and duration of diarrhea, pathological impurities in feces and their consistency. ($P<0.05$).

2. In cases of acute diarrhea, especially in children with a weakened immune system, it is advisable to include highly effective probiotics such as Lactobacillus rhamnosus or Saccharomyces boulardii in the complex treatment. Bifidobacterium bifidum can be used as an adjuvant in mild cases, depending on the need.

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