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To Explore the Value of Testing for Pathogenic Microorganisms during Clinical Testing of Bacterial Diarrhea in Children

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Abstract: *Objective:* To study the practical value of using pathogenic microorganism testing in clinical testing of bacterial diarrhea in children, so as to provide a reference for clinical diagnosis and treatment. *Methods:* 80 children with bacterial diarrhea admitted to our hospital from January 2022 to December 2023 were selected and divided into two groups using the random number table method, with 40 cases in each group. The routine examination group used routine stool examination methods, and the pathogenic microorganism examination group conducted additional pathogenic microorganism examinations on the basis of routine examinations. At the same time, the total effective rate of treatment, the incidence of adverse reactions, the time to stop diarrhea and the disappearance of abdominal pain were compared between the two groups, and the types of pathogenic microorganisms detected by the pathogenic microorganism examination group were counted. *Results:* A total of 38 cases of pathogenic microorganisms were detected in the pathogenic microbial examination group, mainly *Shigella*, *Salmonella*, and *Escherichia coli*. At the same time, the total effective rate of treatment in this group was higher than that of the conventional examination group, the incidence of adverse reactions was lower than that of the conventional examination group, and the time to stop diarrhea and the disappearance of abdominal pain were also shorter than those of the conventional examination group ($p < 0.05$). *Conclusion:* Examination of pathogenic microorganisms during the clinical examination of bacterial diarrhea in children can clarify the types of pathogenic microorganisms, thereby providing support for subsequent precise treatment, thereby improving the treatment effect, reducing the occurrence of adverse reactions and shortening the symptom relief time, so it has high clinical application value.

Keywords: Bacterial diarrhea in children; Pathogenic microorganism testing; Treatment effect; Adverse reactions; Pathogenic microorganism types

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1. Introduction

Bacterial diarrhea in children is one of the common pediatric diseases. It is mainly caused by infections by pathogenic microorganisms such as *Shigella*, *Salmonella*, and *Escherichia coli*. Children often suffer from diarrhea, abdominal pain, fever and other symptoms. If not diagnosed accurately and effectively in time, it may lead to serious consequences such as dehydration and electrolyte disorders, and even affect the growth and development of children [1]. Children are at a

critical stage of growth and development and their digestive and immune systems are not yet fully mature. They have a weak tolerance to diseases. Once bacterial diarrhea occurs, the disease may progress faster. If not diagnosed and treated in time, it may lead to more serious systemic diseases such as sepsis, which will have a long-term impact on children's health [2]. At present, clinical diagnosis of bacterial diarrhea in children relies mostly on routine stool tests. However, routine test methods cannot clearly identify the type of pathogenic microorganisms and can only preliminarily determine the presence of intestinal infection, which will affect the selection of treatment options and therapeutic effects [3]. In actual clinical diagnosis and treatment, because routine tests cannot identify the pathogen, some children may undergo multiple adjustments to the treatment plan. This not only prolongs the course of the disease, but also increases medical expenses and brings additional burdens to the families of children. Based on this, this study analyzes the value of pathogenic microbial testing in clinical testing of bacterial diarrhea in children.

2. Materials and methods

2.1. General information

80 children with bacterial diarrhea admitted to our hospital from January 2022 to December 2023 were selected and divided into a routine examination group and a pathogenic microorganism examination group using the random number table method, with 40 cases in each group, including 22 males and 18 males in the routine examination group, with an average age of 6 months to 10 years old. (4.52 ± 1.36) years old. In the pathogenic microorganism examination group, there were 21 boys and 19 boys, aged 5 months to 11 years old, with an average of (4.68 ± 1.42) years old. There was no statistically significant difference in gender, age and other general data between the two groups of children ($p > 0.05$), so they were comparable.

2.1.1. Inclusion criteria

(1) Meet the clinical diagnostic criteria for bacterial diarrhea in children;
(2) Diarrhea symptoms occur and last for ≥ 1 day;
(3) Guardians are informed and sign a consent form.

2.1.2. Exclusion criteria

(1) Combined with other serious digestive system diseases;
(2) Allergic to test-related reagents;
(3) Used antibiotics in the past week.

2.2. Method

The routine examination team uses routine stool examination methods, collects fresh stool specimens from children, and conducts stool appearance observation and microscopic examination to check for the presence of red blood cells, white blood cells, parasite eggs, etc., and also conducts a fecal occult blood test. The pathogenic microorganism inspection team conducts pathogenic microorganism inspection on the basis of routine inspection.

The specific steps are as follows:

(1) Specimen collection

Same as the routine inspection group, collect fresh stool samples from children and strictly follow the aseptic operating standards to avoid specimen contamination;

(2) Culture isolation

Inoculate the stool specimens onto SS agar medium, MacConkey agar medium and other selective media, and place them at 37 Cultivate in a constant-temperature incubator at ℃ for 18–24 hours, observe the colony morphology, color and other characteristics, and select suspicious colonies for purification and culture;

(3) Identification

Use biochemical reaction tests (such as sugar fermentation tests, oxidase tests, etc.) and serological tests to identify the purified colonies to clarify the types of pathogenic microorganisms. If necessary, use polymerase chain reaction (PCR) technology for further confirmation.

2.3. Observation indicators

The types of pathogenic microorganisms detected by the pathogenic microbial examination group and the corresponding number and proportion were counted; the total effective rate of treatment was compared between the two groups (after 7 days of treatment, it was judged based on the improvement of the children's symptoms). Recovery: symptoms such as diarrhea and abdominal pain completely disappeared, and routine stool examinations were normal; effective: symptoms were significantly reduced, and abnormal indicators of routine stool examinations improved; ineffective: symptoms did not improve or worsened, the incidence of adverse reactions, and the time to symptom relief.

2.4. Statistical methods

SPSS24.0 was used to analyze the data, with *t*-test used for measurement data and χ^2 test used for count data. $p < 0.05$ represents a significant difference.

3. Results

3.1. Statistics on the types of pathogenic microorganisms detected by the pathogenic microorganism inspection team

A total of 38 cases of pathogenic microorganisms were detected in 40 children in the pathogenic microorganism examination group, and 2 cases were not detected. The main pathogenic microorganisms detected were *Shigella*, *Salmonella*, and *Escherichia coli*. The specific types and proportions are shown in **Table 1**.

Table 1. Statistics of pathogenic microorganism types detected by the pathogenic microorganism inspection team [n (%)]

Types of pathogenic microorganisms	Number of detected cases	Proportion
Shigella	15 (39.47)	39.47
Salmonella	12 (31.58)	31.58
Escherichia coli	8 (21.05)	21.05
Others (such as *Campylobacter jejuni*, *Yersinia*)	3 (7.89)	7.89
Total	38 (100.00)	100.00

3.2. Comparison of the total effective rate of treatment between the two groups

The total effective rate of treatment in the pathogenic microorganism testing group was higher than that in the conventional testing group ($p < 0.05$), see **Table 2**.

Table 2. Comparison of the total effective rate of treatment between the two groups [n (%)]

Group	Total number of cases	Recovery	Effective	Ineffective	Total effective rate
Routine inspection team	40	12 (30.00)	11 (27.50)	17 (42.50)	23 (57.50)
Pathogenic microorganism testing team	40	25 (62.50)	15 (37.50)	0 (0.00)	40 (100.00)
χ^2					21.587
p					0.000

3.3. Comparison of the incidence of adverse reactions between the two groups

The incidence of adverse reactions in the pathogenic microorganism testing group was lower than that in the conventional testing group ($p < 0.05$), see **Table 3**.

Table 3. Comparison of the incidence of adverse reactions between the two groups [n (%)]

Group	Total number of cases	Dehydration	Electrolyte imbalance	Intestinal flora imbalance	Overall incidence
Routine inspection team	40	5 (12.50)	4 (10.00)	3 (7.50)	12 (30.00)
Pathogenic microorganism testing team	40	1 (2.50)	0 (0.00)	0 (0.00)	1 (2.50)
χ^2					11.114
p					0.001

3.4. Comparison of symptom relief time between the two groups

The time to stop diarrhea and the disappearance of abdominal pain in the pathogenic microorganism test group were shorter than those in the conventional test group ($p < 0.05$), see **Table 4**.

Table 4. Comparison of symptom relief time between the two groups ($\bar{x} \pm s$, h)

Group	Total number of cases	Stop diarrhea time	Abdominal pain disappearance time
Routine inspection team	40	48.62 ± 6.35	36.85 ± 5.28
Pathogenic microorganism testing team	40	28.35 ± 4.12	20.56 ± 3.74
t		16.936	15.923
p		0.000	0.000

4. Discussion

Accurate diagnosis of bacterial diarrhea in children is the prerequisite for effective treatment, and clarifying the type of pathogenic microorganisms is the key to accurate diagnosis, because there are obvious differences in the selection of treatment options for diarrhea caused by different pathogenic microorganisms. For example, quinolone antibiotics are commonly used for *Shigella* infections, and sensitive antibiotics need to be selected based on the results of drug susceptibility tests for *Salmonella* infections. Conventional stool testing methods mainly assist diagnosis by observing the appearance of stool, microscopic examination, and occult blood tests. Although the operation is simple and time-consuming, it can only initially determine whether there is an intestinal infection and cannot accurately identify the specific types of pathogenic microorganisms. This may lead to clinicians being blind when selecting treatment drugs, which in turn affects the treatment effect, and may even lead to increased bacterial resistance due to inappropriate medication [4]. In the context of the current increasingly serious problem of bacterial resistance, blind use of antibiotics will not only affect individual treatment effects, but may also aggravate regional bacterial resistance, posing a potential threat to public health security. Therefore, it is particularly important to accurately identify pathogenic microorganisms and use antibiotics rationally [5].

In this study, a total of 38 pathogenic microorganisms were detected in 40 children in the pathogenic microbial examination group. The detected species were mainly *Shigella*, *Salmonella*, and *Escherichia coli*, accounting for 39.47%, 31.58%, and 21.05% respectively. This result is basically consistent with the distribution characteristics of bacterial

diarrhea pathogens in children in this region. It also provides specific data support for clinical understanding of the main pathogenic microorganisms in children's bacterial diarrhea in this region, and clarifies these pathogenic microorganisms. After identifying the biological species, clinicians can more clearly grasp the prevalence of different pathogenic microorganisms, thereby laying the foundation for formulating targeted diagnosis and treatment plans and prevention and control measures. For example, in cases where *Shigella* infection accounts for a high proportion, sensitive antibiotics can be prepared in advance to reduce the time for drug selection during treatment. At the same time, the transmission route of *Shigella* (such as fecal-oral transmission) should be emphasized in prevention publicity, and parents should be reminded to pay attention to children's dietary hygiene and reduce the risk of infection. Accurate pathogenic microorganism test results can provide strong support for clinical treatment, which is also reflected in the difference in the total effective rate of treatment between the two groups. The total effective rate of treatment in the pathogenic microorganism test group was 100.00%, and the conventional test group was 57.50%. The treatment effect of the pathogenic microorganism test group was significantly better, because after the pathogenic microorganism types are identified, clinicians can choose more targeted antibiotics based on the susceptibility characteristics of different pathogenic microorganisms, avoiding blind medication [6]. For example, when the test results show that the child is infected by enterotoxigenic *Escherichia coli*, the doctor can choose cephalosporin antibiotics for treatment. If the infection is *Shigella*, quinolone antibiotics can be used, combined with rehydration therapy and other measures, to effectively control the infection and relieve the child's symptoms. In the routine examination group, because the pathogen cannot be clearly identified, doctors may only choose broad-spectrum antibiotics based on experience. This method of medication may not only lead to ineffective treatment due to the drug being insensitive to pathogenic microorganisms, but may also destroy the balance of normal intestinal flora in children and aggravate the condition [7]. In addition, for some bacteria that are naturally resistant to specific antibiotics, such as some *Salmonella* that are resistant to ampicillin, blind use of ampicillin treatment without clearing the species through pathogenic microbial testing will lead to treatment failure, prolong the course of the disease, and increase the pain of the child.

In terms of the incidence of adverse reactions, the pathogenic microorganism test group was only 2.50%, and the routine test group was 30.00%. The risk of adverse reactions in the pathogenic microorganism test group was significantly reduced. This is because precise treatment can quickly control the development of the disease and reduce the number of diarrhea, thus reducing the probability of adverse reactions such as dehydration and electrolyte imbalance [8]. At the same time, targeted medication can also reduce the damage of antibiotics to normal intestinal flora and reduce the risk of intestinal flora imbalance. Due to the poor treatment effect in the routine examination group, children with diarrhea symptoms lasted longer, and the body's water and electrolytes continued to be lost, which made them prone to adverse reactions such as dehydration and electrolyte imbalance. Moreover, long-term use of broad-spectrum antibiotics will inhibit the growth of beneficial intestinal bacteria, causing harmful bacteria to multiply in large numbers, causing intestinal flora imbalance, further aggravating diarrhea symptoms, and forming a vicious cycle. Dehydration and electrolyte imbalance are extremely harmful to children's health. Severe dehydration may lead to circulatory failure. Electrolyte imbalance may affect heart function, nervous system function, etc. If not corrected in time, it may leave irreversible health damage. Therefore, reducing the risk of these adverse reactions is crucial for children's recovery [9].

From the perspective of symptom relief time, the time to stop diarrhea and disappear from abdominal pain in the pathogenic microorganism test group were (28.35 ± 4.12) h and (20.56 ± 3.74) h respectively, which were significantly shorter than (48.62 ± 6.35) h and (36.36) in the conventional test group. 85 ± 5.28) h. This result further confirms the positive impact of pathogenic microbial testing on the treatment effect. Rapid relief of symptoms can effectively reduce the pain of children and improve their comfort. It can also reduce parents' anxiety and improve family satisfaction with medical services. Children have low tolerance for pain and discomfort. Long-term diarrhea and abdominal pain may cause irritability, crying, loss of appetite, etc., which affects nutritional intake and rest, and is not conducive to physical recovery. Precise treatment under the guidance of pathogenic microbial testing can quickly alleviate these symptoms and create good conditions for the recovery of children. In addition, pathogenic microbial testing can also provide important data

for epidemiological investigations. By statistically analyzing the pathogenic microbial testing results of a large number of children, we can understand the main pathogenic microbial types, prevalence trends and drug resistance of children with bacterial diarrhea in the region, thus providing a reference for formulating regional disease prevention and control strategies. For example, this study found that *Shigella* and *Salmonella* are the main pathogenic microorganisms. Relevant departments can strengthen food hygiene supervision based on the transmission characteristics of these two bacteria, such as regulating the processing and storage of meat, eggs and other foods to prevent contamination by *Salmonella*, and at the same time strengthen drinking water hygiene management. In order to avoid the spread of *Shigella* through drinking water; in kindergartens, schools and other places where children gather, once an outbreak of bacterial diarrhea occurs, pathogenic microbial testing can quickly identify the pathogen and guide the implementation of targeted disinfection and isolation measures to avoid the spread of the epidemic and protect the health of more children [10].

In the clinical diagnosis and treatment of bacterial diarrhea in children, in addition to paying attention to the application of pathogenic microbial testing, it is also necessary to make a comprehensive judgment based on the child's clinical symptoms, medical history, and other examination results, because in a few cases there may be mixed infections or diarrhea caused by non-infectious factors, and relying solely on pathogenic microbial testing results may not fully understand the condition. For example, some children may be infected with two or more pathogenic microorganisms at the same time, or may have bacterial diarrhea combined with non-infectious factors such as lactose intolerance. In this case, a comprehensive assessment based on clinical symptoms, medical history, and other examinations is required to formulate a more comprehensive treatment plan; at the same time, when conducting pathogenic microorganism testing. It is necessary to strictly abide by the specifications for specimen collection, storage and transportation to avoid inaccurate test results due to improper specimen handling. For example, sterile containers should be used when collecting fecal specimens, and they should be sent for inspection in a timely manner. If they cannot be sent for inspection in time, they should be refrigerated and stored as required to prevent the death or reproduction of pathogenic microorganisms and affect the test results. Specimen quality is the basis for ensuring the accuracy of test results. Negligence in any link may lead to deviations in test results, which will affect clinical diagnosis and treatment. Therefore, specimen management must be highly valued.

In summary, pathogenic microbial testing during the clinical examination of children with bacterial diarrhea can clarify the types of pathogenic microorganisms, thereby providing a reliable basis for precise clinical treatment, thereby improving the overall effectiveness of treatment, reducing the incidence of adverse reactions, and shortening the symptom relief time. This is of great significance in improving the prognosis of children, and is therefore worthy of widespread clinical promotion and application.

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Disclosure statement

The author declares no conflict of interest.

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