

Original Article

Clinical Characteristics, and Antibiotic Effectiveness in the First 48 Hours in Children Under 5 Years of Age with Bacterial Dysentery

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Abstract

Background: Bacterial dysentery is diarrhea with blood (plus or minus mucus), indicating an invasive infection. With effective antibiotic treatment, clinical improvement occurs within 48 hours, which leads to a reduction in the risk of serious complications and death, a shorter duration of illness, and a reduction in transmission. This study was conducted to investigate the clinical features, risk factors, and effectiveness of antibiotics in the first 48 hours in children under 5 years old with bacterial dysentery.

Method: In this cross-sectional descriptive-analytical study, children less than 5 years old with bacterial dysentery were hospitalized in Ali Ibn Abitaleb and Ali Asghar Hospital in Zahedan, Iran. After obtaining the necessary permits from the ethics committee, the researcher extracted the information on 85 cases of patients diagnosed with bacterial dysentery, taking into account the entry and exit criteria in an accessible way. The information was entered into the questionnaire.

Results: The mean age of the patients was 31.17 ± 16.04 months. 52.9% of patients were girls (n=45). Fever was observed in 100% of patients (n=85). The severity of mild, moderate, and severe dehydration was observed in 36.47%, 40%, and 25.53% of the patients, respectively. The most injected antibiotic was ceftriaxone. White blood cell (WBC) levels decreased significantly after receiving treatment (antibiotic). (before treatment: 13.22 ± 9.91 and after treatment: 8.57 ± 2.71 cells/microliter, P -value=0.001).

Conclusion: Our study showed that antibiotic treatment in bacterial dysentery effectively reduces the serum level of WBC. It is suggested that educational programs for mothers in the field of child nutrition be provided and that the effectiveness of different types of antibiotics be compared in future studies.

Keywords: Bacterial Dysentery; Antibiotics; Diarrhea; Infection

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Introduction

Bacterial dysentery as a major health problem is one of the most important causes of illness and death in developing countries(1, 2). Diarrhea-causing agents include a wide range of viruses, bacteria, and parasites. *Shigella* is an important pathogen in this field. Various studies identify shigellosis as the third main cause of moderate to severe diarrhea in children under 5 years of age(3, 4).

Clinical symptoms of diarrhea caused by *Shigella* begin suddenly after an incubation period of 12 hours to 2 days. It includes severe fever, loss of appetite, nausea, abdominal pain, and watery diarrhea, and after a while, bloody stools with painful bowel movements can begin(5).

However, in some cases, there is a bloody stool from the beginning(5). Extraintestinal complications of *Shigella* infection include bacteremia, genitourinary symptoms, generalized toxic symptoms, and neurological findings(6).

Antibiotic use is recommended to reduce the complications of death caused by bacterial dysentery(7), however, today the antibiotic resistance of bacterial dysentery is increasing, as evidence shows that there is resistance to antibiotics such as ampicillin, amoxicillin, and erythromycin. Therefore, starting and scaling up to conduct drug sensitivity tests for bacterial dysentery cases and educating the community and health service providers about the appropriate use of antibiotics should be considered and trained(7, 8).

Considering the high prevalence of bacterial dysentery and causing death in children under 5 years of age(9), the present study was conducted with the aim of determining the clinical characteristics, risk factors, and the effect of antibiotic treatment in children under 5 years of age with bacterial dysentery.

Materials and Methods

In this cross-sectional descriptive-analytical study, children under 5 years old with bacterial dysentery were hospitalized at Ali Ibn Abitaleb and Ali Asghar Hospital in Zahedan City. The inclusion criteria were bacterial dysentery and less than 5 years old. Patients with incomplete medical records and children older than 5 years were excluded. Definitive diagnosis of bacterial dysentery was based on the clinical symptoms of

bloody stool ≥ 1 , high fever, anorexia, nausea, abdominal pain, and stool culture results. The criterion of positive stool was the presence of white blood cells (WBC) and red blood cells (RBC) in direct microscopic examination and positive culture for the causative agent of bacterial dysentery. The response to the first line of antibiotic treatment was considered to improve fever, reduce the frequency of diarrhea, and reduce the intensity of the presence of blood in the stool on the third day. The study protocol was approved by the ethics committee of Zahedan University of Medical Sciences with the ethics code of IR.ZAUMS.REC.1401.331.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) software version 22 (IBM, Chicago, USA) was used to conduct statistical analysis. The mean \pm SD represented the quantitative variables, while the number (percentage) indicated the qualitative variables. Paired t-test was used to compare the mean variables before and after treatment. A statistically significant result was identified if the *P*-value was below 0.05.

Results

The mean age of patients was 31.17 \pm 16.04 months. The lowest and highest ages were 6 and 59 months, respectively. The received antibiotics included ceftriaxone, ciprofloxacin, and metronidazole, which the patients had received singly or in combination. The most received antibiotic was ceftriaxone, which was injected into 72 (84.7%) patients. 75 (88.2%) patients had improved after receiving the first antibiotic regimen during hospitalization, and other patients responded to the second line of antibiotic treatment and recovered. The gender of the patients included 45 (52.9%) girls and 40 (47.1%) boys. 62.4%, 30, and 3.5 used breast milk and formula, respectively. **Table 1** shows the demographic characteristics of children with bacterial dysentery.

All children had diarrhea (n=100). 82.4% and 38.8% had fever and vomiting, respectively. Rectal prolapse was reported in 7% of patients. The most common type of stool was mucous-bloody, which included 68 (80%) patients. The lowest form of stool was mucous (n=1, 1.2%). Mild, moderate,

and severe dehydration were 36.7%, 40%, and 23.53%, respectively (Table 2).

White blood cell (WBC) levels before and after

treatment were 13.22 ± 9.91 and 8.57 ± 2.71 cells/microliter, and a statistically significant difference was observed between the two groups ($P < 0.001$).

Table 1. Demographic characteristics of children with bacterial dysentery

Variable	Result
Age (month), mean \pm SD	31.17 \pm 16.04
Sex, n (%)	Girl
	45 (52.9)
Type of nutrition, n (%)	Boy
	40 (47.1)
	Mother's Milk
	53 (62.4)
	Dry Whole Milk
	3 (3.5)
	Both
	29 (34.1)

N, number; Sd, Standard deviation

Table 2. Clinical manifestation in children with bacterial dysentery

Variable	Result
Diarrhea, n (%)	85 (100)
Fever, n (%)	70 (82.4)
Vomiting, n (%)	33 (38.8)
Rectal prolapse, n (%)	6 (7)
Stool condition, n (%)	Watery
	16 (18.8)
	Mucus
	1 (1.2)
Severity of dehydration, n (%)	Mucous-bloody
	68 (80)
	Mild
	31 (36.7)
	Moderate
	34 (40)
	Severe
	20 (23.53)

N, number

Discussion

The purpose of this study was to determine the frequency of clinical features, risk factors, and the effectiveness of antibiotics in the first 48 hours in children under 5 years old with bacterial dysentery. Bloody diarrhea is an inflammation of the intestine, usually the large intestine, that leads to frequent and severe diarrhea with visible blood in the stool. It is known as one of the causes of abdominal pain in children. *Shigella* spp is one of the common causes of bloody diarrhea in children(10).

Bloody diarrhea can be treated with antibiotics such as ciprofloxacin, ceftriaxone, and carbapenems(11). Ceftriaxone had the highest frequency (88.2%) among the injected antibiotics. Cohen et al. stated antibiotic selection depends on suspected factors, host conditions, and geographic epidemiology(12).

In our study, the prevalence of bacterial dysentery was almost equal in both sexes. Contrary to our results, in the cross-sectional study of Ali Nor et al. 62% of patients were girls(13). On the other

hand, Jahan et al. showed that male gender was a risk factor for bacterial dysentery in children under 5 years of age(14). It seems that the gender factor in the studies is different according to the studied population and is not a stable and reliable risk factor for bacterial dysentery.

The mean age of patients with dysentery was 31.17 ± 16.04 months. In line with our results, Ferdous et al. in their study among about 2300 children under 5 years of age with dysentery showed that the incidence of bacterial dysentery was different among age groups(10). In their study, Mcquade et al. showed that age was higher than the risk factors for bacterial dysentery in children under 5 years of age(15).

Diarrhea was one of the presenting symptoms in all studied patients. In agreement with our results, Vubil et al. showed that all children with shigellosis complained of diarrhea(5). Considering the nature of shigellosis and the pathomechanism of this bacterium, all clients complained of bloody diarrhea.

Fever was one of the complaints and symptoms

of dysentery in 70 (82.4%) patients. In line with our results, Vubil *et al.* also reported in Mozambique children that fever is one of the main symptoms of bacterial dysentery(5). 38.8% of patients reported vomiting. In the study by Posovszky *et al.* on infectious gastroenteritis children, showed that vomiting is more common in viral cases than in bacterial cases(16), which was similar to our findings. It seems that the complaint of vomiting is a non-specific symptom in infectious cases, which has different prevalence depending on the causative agent. Rectal prolapse was found in 7% of patients with bacterial dysentery, which was a slightly higher prevalence than the study of Vubil *et al.* with an incidence of 4%(5). Probably the reason for the difference in the results was the difference in the presence of other risk factors for the occurrence of rectal prolapse such as BMI and different age in the studied population. 23.53% of patients had severe dehydration at the beginning of the visit. Dehydration is one of the main causes of infant and child mortality worldwide, and the most common causes of dehydration in children are vomiting and diarrhea(17).

A study that clearly measured the degree of dehydration of patients with bacterial dysentery was not found. Contrary to our results, Sharma *et al.* in their study in India showed that 70% of children who presented with complaints of acute diarrhea had severe dehydration(18). Probably the reason for the difference in the results is that in our study, we only examined the cases of bacterial dysentery, and in acute watery diarrhea cases, the prevalence of severe dehydration is likely to be higher.

We showed that in children under five years of age with bacterial dysentery, the mean WBC decreased significantly after hospitalization and antibiotic treatment. Christopher *et al.* in a review of 16 clinical trials that investigated the effect and safety of antibiotic treatment in dysentery caused by *Shigella*, recommended antibiotic treatment in all cases of bacterial dysentery, which was associated with improvement of clinical symptoms and reduction of WBC (19).

Conclusion

The most injected antibiotic was ceftriaxone. Fever was observed in all patients with bacterial dysentery. The mean serum WBC level decreased

significantly after treatment with antibiotics. It is suggested that more multicenter studies with higher sample sizes should be done in order to compare the effectiveness of antibiotics in the treatment of bacterial dysentery.

Conflict of interests

There is no conflict of interest.

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