Original Research Article

Clinico etiological spectrum and antibiotic sensitivity profile of bacillary dysentery in a tertiary care hospital in Kashmir, India

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ABSTRACT

Background: Diarrheal disorders along with dysentery constitute the second killer infections in childhood. In fact, more than half of the dysentery cases are recorded in children under 9 years of age. Shigella infection comprises well over 60% of dysentery cases in age group of 6 month to 5 years. *Shigella flexneri* is the commonest etiology encountered in developing nations. *E. coli* and campylobacter comprises the second important bacterial isolates in childhood dysentery. The objective of this study was to ascertain the clinical spectrum, etiological profile and local antibiotic sensitivity of the enteropathogens isolated.

Methods: 147 serial dysentery cases admitted in GB Panth hospital Srinagar, which is an associated hospital of government medical college Srinagar from October 2014 to September 2015 were taken up for the study. A thorough and detailed history and examination was taken and recorded as per the proforma. Freshly collected stool sample was subjected to gross and microscopic examination; and after due bacteriological instructions was cultured on enrichment and selective media as per the need. Antibiotic sensitivity was done using disc diffusion method.

Results: Maximum cases occurred in 1-5 years age group. Malnutrition grades II and III recorded the highest admissions. Most of cases had moderate dehydration. Although not frequent severe anemia, paralytic ileus and renal failure were the commoner complications. Shigella was grown in 12.24% of cases. Among them *Shigella flexeneri* serotype was encountered in 65% patients. Drug resistance was seen for many of the antibacterials like amoxycillin, ampicillin, norfloxacin, cotrimoxazole and nalidixic acid. However, they were susceptible to ceftriaxone and amikacin in well over 80% cases. *E. coli* isolates had similar antibiotic sensitivity profiles, with most susceptibility to amikacin and ceftriaxone.

Conclusions: Drug sensitivity and resistance pattern is a variable phenomenon and changes from place to place and time to time. Hence there is a need to document the local pattern of an area so as to guide a judicious antibiotic administration.

Keywords: Antibiotic resistance, Bacillary dysentery, Complications dysentery, Enteropathogens, Shigella

INTRODUCTION

The term dysentery has been applied to the symptom complex, which may be produced through the infection of the bowel wall itself or the invasion of its walls by different organisms. Its diagnosis is clinical, and is entertained if patient presents with acute onset of intestinal colic, tenesmus, frequent passage of loose motions which contain mainly blood and mucus with very little formed elements, if any, and on microscopic examination demonstrate plenty of RBC's and puss cells.[1,2] Whereas the great majority of cases manifest as

acute disease, some 10% cases become chronic and still few (3%) may become chronic carriers.

This fact accounts for the annual seasonal outbreaks of the disease.[3] Diarrhea and dysentery rank second among the killer infections in 0-5 years age group. Children under 9 years of age account for 60% of clinical cases of dysentery, with more than one third occurring in those between 1-4 years.[1]

About 60% of all episodes and 61% of all deaths attributable to shigellosis involved children younger than 5 years.[4] Enteric pathogens associated with dysentery namely, Shigella, EIEC, EHEC, Salmonella species, Vibrio parahaemolyticus, Campylobacter, Yersinia and Entamoeba histolytica have been well documented. *Shigella flexneri* continues to be the most common serogroup isolated in India, in contrast to the developed world where *Shigella sonnei* is common.[4-6] *E. coli* and Campylobacter jejuni are responsible for combined 30 to 40 % of dysentery cases.[7]

There has been a promiscuous transfer of drug resistance in gram negative bacteria and among the various factors responsible the R-factor is most important one.[8] The development of multiple drug resistance in bacillary dysentery poses a problem to clinicians. As such, it needs close and careful observation.[9]

Increasing number of isolates are showing resistance to nalidixic acid and quinolones, leading to therapeutic problem which needs to be studied in detail.[10,11] In Kashmir also, as in most other states in india, relatively severe epidemics of dysentery have struck in past, and recently multiple drug resistance has been encountered.

Also, there is a paucity of data from north india regarding the etiology and epidemiological factors in bacillary dysentery. In view of that present study has been undertaken.

METHODS

Patients of pediatric age group presenting with clinical features of dysentery who were admitted with acute onset of intestinal colic, tenesmus, frequent passage of loose motions containing mainly blood and/or mucus were selected for this study.[1]

Criteria for admission

- Dysentery with persistent vomiting
- Dysentery with moderate or severe dehydration
- Dysentery in a malnourished child
- Dysentery with more than 20 motions per 24 hours
- Dysentery with complications.

A thorough and detailed clinical history of these patients was recorded (vide proforma).

History regarding time since onset, drug intake with dose and duration prior to admission, water supply and dietary habits was also taken. The state of hydration in these patients was assessed.

Nutritional status was assessed as per the recommendation of nutrition sub-committee of Indian academy of pediatrics.[12] Socioeconomic status was classified as per the Kuppuswamy scale.[13] Routine investigations were done on the day of admission.

Stool examination

Fresh stool sample containing fleck of mucus, but free from urine was diluted with normal saline and examined microscopically for ova, cysts and parasites.[14]

A fleck of mucus was stained with methylene blue and examined under microscope for RBC's, polymorphs and macrophages.

Stool culture

Fresh stool specimens were taken with proper bacteriological instructions and plated either directly on to McConkey's agar/ Leifsons desoxycholate citrate agar, or after enrichment in enrichment media like G.N broth or selenite-F-broth. The media were incubated aerobically at 37°C. Subcultures were done on D.C.A and Mc Conkey agar plates after 18-24 hours incubation. The organisms were identified based on colony character, staining, motility, and various biochemical and serologic reactions. All bacterial isolates were subjected to antibiotic sensitivity using disc diffusion method.[14]

Statistical analysis

Data was described as Mean±SD and percentage age. SPSS 16.0 and MS Excel software were used for data analysis.

RESULTS

During the one-year period from October 2014 to September 2015, 12907 patients were admitted out of which 397 were suffering from dysentery giving an in-hospital percentage incidence of around 3%. Out of these, 147 cases which were admitted in our unit were taken for the present study. Maximum number of cases were admitted in the month of August, followed by July, June and September. No case was admitted in January and February. The incidence of dysentery was highest in the 1-4 years age group (No. of cases 53), and the lowest below 6 months age group (No. of cases 5). The cases of dysentery studied showed male predominance (male 96/female 51). Maximum cases around 72% belonged to rural areas. Maximum number of cases (65.31%) belonged to the areas which used either open water supply or interrupted piped water supply.

Table 1: Symptoms.

Symptoms	No. of cases	%
Loose motions with mucus	147	100
Motions with mucus and blood	134	91.16
Abdominal cramps	105	71.43
Tenesmus	110	74.83
Vomiting and nausea	76	51.70
Fever	87	59.18
Loss of appetite	121	82.31
Weakness and/or myalgias	80	54.42

Around 65.9% cases belonged to class IV and class V, 27.89% belonged to class II and class III and 6.13% belonged to class I of Kuppuswamy scale. Maximum cases were recorded in protein energy malnutrition grades II and III. Maximum cases belonged to the group taking full diet. Least number belonged to exclusively breastfed group. A 64 cases presented for admission within one week of the onset of symptoms. Maximum cases had consumed drugs before admission on an outpatient basis. Many cases (57.14%) had moderate dehydration. The relative frequencies of symptoms in the cases studied were as in (Table 1).

Table 2: Time to stool clearance.

Period of stay	No. of cases	%
Less than 3 days	17	11.56
4 days to 1 week	47	32
1 to 2 weeks	60	40.81
Greater than 2 weeks	23	15.64

Most of cases needed hospitalization for more than one week to revert the frequency of motions to normalcy and for disappearance of blood and mucus (Table 2).

The relative frequencies of complications in patients with dysentery are shown in (Table 3).

Severe anemia needing blood transfusions was detected in 17 patients. The spectrum of organisms cultured from the stool samples are shown in Table 4. Maximum number of cases on stool culture showed the growth of lactose fermenting *E. coli* in pure culture which was taken as insignificant growth.

Table 3: Complications and frequency.

Complication	No. of cases	%
Severe anemia	17	11.56
Paralytic ileus	13	8.84
Renal failure	8	5.44
Chronic colitis	7	4.76
Convulsions	5	3.40
Bronchopneumonia	5	3.40
Encephalopathy	2	1.36
Post dysenteric mal absorption	2	1.36
Hemolytic uremic syndrome	1	0.68
Joint involvement	1	0.68

Table 4: Micro-organisms cultured from stool.

Micro organisms	No. of cases	%
Shigella	18	12.24
Salmonella	6	4.08
E. coli	16	10.88
Kliebsella	8	5.44
Serratia	6	4.08
Enterobacter	5	3.40
Providencia	2	1.36
Pseudomonas	3	2.04
Insignificant growth	83	56.46
Total	147	100

Bacterial yield on stool culture depended heavily on time since onset of symptoms and pretreatment with antibiotics before the culture. *Shigella flexneri* (65%) was the commonest serotype encountered followed in order by shigella dyseterie (18%), shigella boyde (12%) and shigella sonnei (5%). Shigella were grown in those cases when the patient presented early within the first week of start of symptoms.

Table 5: Organisms recovered in relation to time of onset and previous antibiotic use.

Micro-organisms	Time since onset			Drug intake		
	<1 week	1-2 week	>2 weeks	None	Single antibiotic	Multiple antibiotics
Shigella	18			10	6	2
Salmonella	1	5			4	2
E coli	10	6			3	13
Klebsiella		3	5			8
Serratia		4	2		1	5
Enterobacter		5			1	4
Providencia		2				2
Pseudomonas			3			3
Insignificant growth	45	31	7	13	39	31

Similar was the case with pathogenic non-lactose fermenting *E. coli*. Other organisms were usually grown after the first week or when the patient had consumed one or more antibiotics. Insignificant growth was obtained in 45 cases even when their stool was plated in first week (Table 5).

Antibiotic sensitivity pattern of two main bacterial isolates implicated in dysentery cases is shown in Table 6.

Table 6: Antibiotic sensitivity of Shigella and *E. coli*.

Antibiotic	Shigella [N (%)]	E. coli [N (%)]
Amoxicillin	7 (38.8)	2 (12.5)
Ceftriaxone	15 (83.3)	13 (81.2)
Amikacin	16 (88.8)	15 (93.7)
Ampicillin	8 (44.4)	5 (31.2)
Norfloxacin	6 (33.3)	5 (31.2)
Cotrimoxazole	4 (22.2)	4 (25)
Nalidixic acid	4 (22.2)	5 (31.2)

DISCUSSION

An incidence of around 3.07% was recorded for dysentery in hospitalized cases. Sharma et al, observed that bacillary dysentery accounted for 6.3% of cases in pediatric wards for one year.[15] The highest incidence was recorded in August followed in order by July, June, and September. The incidence was lowest in winter months. This is in agreement with Mata et al, and Sharma et al.[15,16] Increased incidences during summer months is a part of general prevalence in gastrointestinal infections in these months.

In the present study, the age of the patients varied from 2 months to 13 years. Lowest number of cases were recorded below 6-month age, whereas largest number of cases were seen in 1-4-year group. This is in conformity with the study done by Reller et al, and Sharma et al.[15,17] Although in a small study like this, nothing can be commented about the relationship with age, yet the lowest incidence below 6 months can be explained on the basis of exclusive breast feeding and its protective role. Increased incidence in 1-4 age group is because of lack of sense of hygiene and resultant contamination in these children. Cases studied showed a male predominance of the order of 65.3:34.7. This is in agreement with Sharma et al and Naik et al.[5,15] However nothing can be commented on this relation.

A 63.3 % of the cases represented the population which either used open water supply in the form of streams, rivers, tanks, wells, springs etc. or had intermittent tap water supply, when during the period of interruption, they had to resort to open water supply. Present study corroborates the observations of Moore et al, and Wolffe et al.[18,19] However since 34.7% of the cases belonged to the population using uninterrupted tap water supply,

factors other than water also have a role to play in the spread of this disease.

Highest incidence 65.98% of dysentery was found in the lowest socioeconomic class. This is in agreement with the studies of other workers like Moore et al, Rao and Murty et al and Reller et al.[17,18,20] Poor living conditions, overcrowding, ignorance and illiteracy all contribute to the increased burden of diarrheal diseases.

Highest incidence was found in grade II nutritional status, followed by grade III. Although there is no positive correlation between the attack rate of shigellosis with nutritional status of patients, as few as 200 shigella microorganisms can cause dysentery in a healthy adult. However, dysentery in a malnourished child is fraught with complications.

In present study patients presented with bloody stools in around 91% cases and fever in 82% cases. Dutta et al, documented fever in 63.8% and abdominal pain in 20.4% of children presenting with bloody diarrhea.[21] Sharma et al, documented loose motions with blood in 100%, fever in 58% and vomiting in 22% cases.[15] In present study severe dehydration was found in 13.6% and moderate dehydration in around 57.14%. Dutta et al, documented moderate dehydration in 87.8% and severe dehydration in 10% of dysentery cases.[21] Renal failure was found in 5.44% cases as against in 19.3% in study by Sharma et al.[15] Adequate fluid therapy prevented its occurrence in most of the cases. 86.3% cases showed hyponatremia, 7.5% cases had serum sodium in normal range while as around 6% cases had hypernatremia. While as 83.67% cases had serum potassium in normal range, 16.33% cases had hyperkalemia.

Complications like bronchopneumonia in 3.4%, paralytic ileus in 8.84% cases, hemolytic uremic syndrome in one case (0.68%), encephalopathy in 1.3% and joint involvement in one case were recorded in present study. Thapa et al, had reported central nervous system (CNS) manifestations in 45% of patients, renal failure in 25% and subacute intestinal obstruction in 5% of cases.[22]

Out of all 147 cases we documented 18 cases of shigella, 16 cases of pathogenic E. coli and 6 cases of salmonella stool cultures. The present study is in agreement with that of Arya et al, Mata et al and Agrawal et al, where the definite pathogens like shigella could be isolated in a relatively small percentage of the cases.[9,16,23] Factors that account for known difficulty in culturing shigella are that they localize themselves in the epithelial cells and lamina propria after invasion, and shedding of bacilli is inconsistent and unevenly distributed in faces. *Shigella flexneri* (65%) was the commonest serotype encountered followed in order by *Shigella dyseterie* (18%), *Shigella boyde* (12%) and *Shigella sonnei* 5%.

The findings are consistent with those of Pazhani et al, in Kolkata, who documented *S. flexneri* as the most

common isolate (60%).[10] Mamatha et al, (Manipal) also reported *S. flexneri* in majority of cases (45%).[11] Uppal et al, from New Delhi also isolated *S. flexneri* in 78.5% of cases.[24] This is in accordance with the fact that *S. flexneri* is more common in developing countries in contrast to developed countries where *S. sonnei* is most common Kotloff et al.[25] In present study most isolates of shigella were sensitive to ceftriaxone and amikacin. There was fairly significant resistance to cotrimoxazole, norfloxacin, nalidixic acid and ampicillin in most of the shigella isolates. In their study by Rajeshwari et al, among the Shigella spp., majority were resistant to nalidixic acid (95.7%), norfloxacin (87%), and amoxicillin (56.5%). Most isolates were sensitive to cefotaxime, gentamycin and amikacin (95.6% each).[24] 16 cases had positive stool cultures of *E. coli* in present study. Arya et al, isolated *E. coli* in 26.4% cases of bacillary dysentery. A total of 18 isolates of *E. coli* were documented (30% of total dysentery cases) by Rajeshwari et al. [23,24]

Around 90% *E. coli* isolates were sensitive to amikacin followed by around 80% to ceftriaxone. Again, there was higher resistance to antibiotics like ampicillin, amoxicillin, nalidixic acid and norfloxacin. In their study Rajeshwari et al, 95% of isolates were resistant to commonly used drugs amoxicillin, 88.9% of strains were resistant to nalidixic acid, resistance to norfloxacin was observed in 66.7% cases. 56% isolates were resistant to cefotaxime.[24] However, majority of strains were susceptible to aminoglycosides, gentamycin (88.8%) and amikacin (100%).

CONCLUSION

In the present study in vitro sensitivity reports have been variable. Very few drugs were 100% effective for all the strains of a particular organism isolated in stool culture. The drug resistance pattern changes from place to place and time to time. Thus, local susceptibility patterns should be assessed periodically to guide drug therapy.

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