

Etiology of Bloody Diarrhea among Children Admitted to Maternity and Children's Hospital-Erbil

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Abstract

Background: Bloody diarrhea plays a major role in morbidity and mortality especially in developing countries, it is usually a sign of invasive enteric infection, there is a thought that amoebic dysentery is more common than bacillary dysentery in Iraq, and from 1989 to 1997 amoebic dysentery increase from 20000 to 550000 patients.

Objectives: This study aims to:

1. Outline the incidence of various infectious causes of bloody diarrhea in Erbil district.
2. Assess the effect of multiple factors like age, sex, source of water supply, etc... On the incidence of amoebic and bacillary dysentery.
3. To provide baseline data for making strategic plan to reduce the diarrhoeal mortality and morbidity.

Methods: A prospective case- series study was conducted on 116 infants and children aged 2 month – 12 years admitted to hospital complaining of bloody diarrhea. Information was taken from their mothers regarding (age, sex, geographical area, feeding pattern and source of water supply) , their stool have been examined for the presence of RBC, leukocyte, parasitic cyst and trophozoite, however blood examination was conducted for the presence of band.

Results: The results reveal 77.5% of patients were in the younger age group (<2 year). Entamoeba histolytica was the most common enteropathogen isolated in 60.3% of patients, other enteropathogens identified were Shigella 3.5%, E.coli 2.6%, Salmonella 2.6%, mixed infection were reported in 1.72%, 28.5% of patients have non isolated pathogen.

On the other hand, source of water supply and type of feeding have significant effect on incidence of enteropathogens. The presence of fever, vomiting, convulsion and band in peripheral blood mostly indicates bacterial etiology.

Conclusion: Entamoeba histolytica was the commonest enteropathogen isolated; the incidence of bloody diarrhea was more in younger age group. There was significant effect of source of water supply on the incidence of bloody diarrhea with most enteropathogen isolated from patients who have well water supply. Breastfeeding was protective against enteropathogen especially bacterial agents in infants under 6 month of age. Presence of band in the peripheral blood indicates most probably bacterial agents.

Key words: Bloody diarrhea, etiology, Entamoeba histolytica

Al-Kindy Col Med J 2008; Vol .4 (2): P19-24

Introduction

a. Infectious Causes

Amoebic Dysentery: Entamoeba histolytica is the causative agent. It's a common problem in areas with poor hygiene.⁽²⁾ Most infected individual are asymptomatic but some present with acute cramping diarrhea that contain blood and mucus associated with low grade fever, tenesmus which last days to weeks.⁽³⁾

-Shigella sp. (bacillary dysentery): it's caused by a gram negative non motile organism of enterobacterae family called shigella, their transmission is fecal-oral, these organisms are not killed by stomach acid therefore only a small number of organism (less than 100) are needed to cause the disease⁽⁴⁾

Shigellosis is a serious disease in children <2 year of age and unusual in <3month, incubation period 2-4days.⁽⁵⁾ The diarrhea may be watery and of large volume initially evolving into frequent small volume bloody mucoid stool however some children never progress to the stage of bloody diarrhea, neurological finding (convulsion, nuchal rigidity, confusion) occur in as many as 40% of hospitalized infected children. Other infectious causes of bloody diarrhea include Campylobacter sp., Escherichia coli in both Enterohemorrhagic

Escherichia coli and Enteroinvasive Escherichia coli strain, Yersinia enterocolitica, Salmonella and Clostridium difficile which predispose to antibiotic associated diarrhea.⁽⁶⁾

b. Non infectious causes:

1. Cow/Soya milk allergy: The estimated prevalence is 0.5-1%, colic, vomiting and diarrhea are the major symptom, stool often contains blood, mucus and abundant eosinophil. viral gastroenteritis sometime precedes the onset of symptom.⁽⁶⁾

2. Intussusceptions: Characteristically thriving infant 3-12 month of age develops paroxysmal abdominal pain with screaming and drawing up the knees. Vomiting and diarrhea occur soon after ward in 90% of cases, bloody stool movement with mucus appear within 12 hr in 50-60% currant jelly stool.⁽⁵⁾

3. Ulcerative Colitis: Produce crampy lower abdominal pain with bloody diarrhea and weight loss. It occurs during childhood or adolescence 10-20years.⁽⁷⁾

The prevalence of amoebic infection varies from 5-81% with the highest frequency being in the developing countries with inadequate sanitation⁽⁶⁾ and there is a thought that amoebic dysentery is more common than bacillary dysentery in Iraq, and

from 1989 to 1997 amoebic dysentery increase

from 20000 to 550000 patients ⁽⁸⁾.

Methods

Out of 3428 diarrheal patients admitted to children wards in maternity and children hospital in Erbil, 280 patients recognized to have bloody diarrhea. A prospective study was conducted over a period of 7 months from January to July 2002 on 116 infants and children between the age of 2 month and 12 years old who have been selected randomly from the above mentioned 280 patients, the diagnosis based on the presence of visible blood, pus and mucus in the stool.

Data, including name, age, sex, type of diarrhea, fever, other gastrointestinal symptom, neurological symptom, feeding history (breast, bottle, mixed) and source of water supply were recorded.

For each child the following investigation were carried out

1. Stool specimens collected and send for microscopical examination in laboratory of maternity and children hospital to be checked for presence of RBC, WBC, and Entamoeba histolytica trophozoit and cyst.

2. A blood sample of 1 cc collected in red heparinized tube and send for hematological

Results

Out of 3428 diarrheal patients admitted to maternity and children hospital, 280 patients recognized to have bloody diarrhea, which represent 8.2%. From these 116 patients selected

department of laboratory for estimation of hemoglobin concentration, total WBC and differential count.

In addition, for those patients having clinical and laboratory suspicion of pyogenic infection (high fever, convulsion, band, toxic granulation and shift to left in their blood examination results), stool culture was conducted from the first stool sample and cultured on:

1. MacConkey agar inoculated at 37 centigrade overnight.

2. Tetrathionate enrichment media with drop of iodine inoculated at 37 centigrade overnight.

Bacterial growth on MacConkey agar was checked out, so that culture result with suspicious colony, API 20E biochemical test and serotyping using antisera were performed.

Concerning tetrathionate, drop from solution cultured on SS agar inoculated for another 24hr and checked for growth of bacteria. Culture results with suspicious colonies of salmonella or shigella, Api 20E biochemical test and serotyping using antisera were performed.

randomly and the analyzed using Chi 2 and t test accordingly.

Regarding the causative agents of bloody diarrhea results are shown in **Table 1** and which indicates that the most common enteropathogen isolated was Entamoeba histolytica

Table (1) Enteropathogen isolated from stool sample of 116 patients with bloody diarrhea.

According to age patients' age between 2 month and 12 years were grouped into 3 age groups as shown in **Table 2** which demonstrate that bloody diarrhea is common in younger age group.

<i>Type of Enteropathogen</i>	<i>No.</i>	<i>Percentage</i>
E.h.	70	60.3 %
Giardia lamblia	1	0.9 %
Shigella	4	3.4 %
E.coli	3	2.6 %
Salmonella	3	2.6 %
Mixed pathogen	2	1.7 %
Non isolated	33	28.5 %
Total	116	100 %

P value=0.02

(Table -2)
Enteropathogen Isolated From Stool Sample of 116 Patients with Bloody Diarrhea in Relation to Age Groups.

Age	E.h.	Bact.	Mixed	Non-isolated	Giardia lamblia	Total
< 2 Y	54	8	0	28	0	90
2-4 Y	7	2	1	3	0	13
> 4 Y	9	0	1	2	1	13
Total	70	10	2	33	1	116

P value=0.02

The enteropathogens isolated from patients according to their geographical distribution was shown in **Table 3**

P value=0.199

(Table 3)
Enteropathogen Isolated from Stool Sample of 116 Patients with Bloody Diarrhea in Relation to Geographical Area

Geographical area	E.h.	Bact.	Mixed	Non-isolated	Giardia	Total
Urban	42 (57%)	6 (8%)	1 (1.3%)	24 (32.4%)	1 (1.3%)	74 (100%)
Rural	28 (66.8%)	4 (9.5%)	1 (2.3%)	9 (21.4%)	0 (0.0%)	42 (100%)
Total	70	10	2	33	1	116

P value=0.199

Regarding source of water supply most of enteropathogens have been isolated from patients with well water supply as shown in **Table 4**.

P value=0.001

Table (4) Enteropathogen Isolated from Stool Sample of 116 Patients with Bloody Diarrhea in Relation to Source of Water Supply

Source of Water Supply	E.h.	Bact.	Mixed	Non-isolated	Giardia	Total
Well	54	5	1	19	1	80
Network	12	3	0	10	0	25
Both	4	2	1	4	0	11
Total	70	10	2	33	1	116

P value=0.001

The relation of clinical symptom to the type of enteropathogen are shown in **Table 5** which demonstrate that fever, vomiting and convulsion were more common in patients with bacterial etiology .

Table (5) Enteropathogen Isolated from Stool Sample of 116 Patients with Bloody Diarrhea in Relation to Clinical Symptom and Sign.

Type of Enteropathogen	Tenesmus	Vomiting	Fever	Convulsion
E.h.	62 88.6%	25 35%	9 13%	0 0%
Bact.	8 80%	9 90%	4 40%	4 40%
Mixed	1 50%	1 50%	0 0%	0 0%
Non-isolated	27 81%	20 60%	4 12%	5 15%
Giardia	0 0%	1 100%	0 0%	0 0%

P value=0.012

According to the results of stool examination leukocyte and RBC were most commonly found in patients with Entamoeba histolytica and bacterial etiology as shown in (Table 6).

Table (6) Results of Stool Examination According to Type of Enteropathogens

Type of Enteropathogen	Leukocyte	Leukocyte +RBC	Non	Total
E.h	21	46	3	70
Bact.	2	7	1	10
Giardia	0	0	1	1
Mixed	1	1	0	2
Non- isolated	4	0	29	33
Total	28	54	34	116

P value<0.0001

In 16 infants who were under 6 months of age the type of feeding were compared with enteropathogens isolated and the result was shown in Table 7

Table (7) Enteropathogen Isolated from Stool Sample of 16 Patients <6 Month of Age with Bloody Diarrhea in Relation To Type of Feeding

Type of Feeding	E.h.	Non-isolated	Total
Breast	5	1	6
Bottle	6	1	7
Both	0	3	3
Total	11	5	16

P value=0.017

Culture results obtained from 25 patients with bands in their blood sample were compared with that obtained from 10 patients without band as shown in table 3.10 and figure3.6 which demonstrate that there is significant relation between presence of and isolated bacterial agents.

P value=0.008

Table (8) Comparison Between Culture Results of Band Positive and Band Negative Patients with Bloody Diarrhea

Type of Bacteria	Band	
	Positive	Negative
Salmonella	3	0
Shigella	4	0
E. Coli	2	2
Escape	3	0
Total	12	2

Discussion

Out of 3428 diarrheal patients admitted to maternity and children hospital, 280 patients recognized to have bloody diarrhea, which represent 8.2%, this incidence agrees with others who found that 10% of diarrhoeal episodes in children have visible blood in the stool.⁽⁸⁾

Bacteria and parasite of possible etiological significance in bloody diarrhea were investigated in this study, while other less common etiological

causes or organisms that need special media and growth conditions for isolation like Yersinia and Campylobacter were not investigated.

Results that shown in (Table-1) demonstrate that Entamoeba histolytica identified in 70 patients (60.3%), however this percentage is much higher than that obtained by Ameen et al who found that Entamoeba histolytica was the commonest parasite identified at a rate of (39.7%)⁽¹⁰⁾, and this could be justified since our sample collected from

patients with bloody diarrhea while their sample collected from patients with diarrhea in general, and there is a fact that chlorination sufficient to kill bacteria will not affect the cyst of *Entamoeba histolytica* but boiling or heating water to 50 C kills cyst⁽¹¹⁾

According to WHO non typhoidal salmonella causes 1-5% of gastroenteritis in most developing countries⁽¹⁾ and this agree with our results in which 3 cases of salmonella have been isolated (2.6%) and also approximate the result obtained by al-Majidi which was 3.5%.⁽¹²⁾

Shigella was isolated from 4 patients (3.4%) similar finding (4%) have been obtained by Soenarto et al⁽¹³⁾ but in contrary to other reports who found that *Shigella* is the pathogen most frequently isolated from the stools of young children with bloody diarrhea in developing countries.⁽¹⁴⁾

The difference in results according to Pickering et al may reflect the difficulties encountered in isolating enteric pathogen such as shigella by conventional techniques⁽¹⁵⁾ or as Harris et al found that the prolonged intestinal inflammation after bacterial eradication and fecal leukocytes may indicate acute bacterial diarrhea when stool culture falsely yield normal flora⁽¹⁶⁾ or it is due to misuse of antibiotics in our community.

The results show that 33 patients (28.5%) have a non-isolated pathogen, 4 patients with band in their peripheral blood but with negative stool culture.

According to WHO diarrhoea is common in children especially those between 6 month and 2 year of age⁽¹⁷⁾, this agrees with our results which showed that the highest incidence of bloody diarrhoea occurred among the age group of less than 2 year (77.5%) as in **Table (2)**. Fifty four patients (77.1%) of those having *Entamoeba histolytica*, and 8 patients (80%) of those having bacterial agents are below 2 years of age.

Table (3) showed that there is no significant relation between geographical areas and enteropathogens although *Entamoeba histolytica* and bacteria comprise 57%, 8% in urban and 66.8 %, and 9.5 % in rural area respectively.

Comparing the sources of water supplies with enteropathogens the incidence of *Entamoeba histolytica* and bacterial agents was 77.1%, 50% in well water supply and 17.1%, 30% in network supply respectively. As in table (4) which shows that there is highly significant relation p value = 0.001.

This high percentage of isolated etiological agent from children with well water supply may be due to sewage contaminated wells from which water was consumed without treatment or disinfection.⁽¹⁸⁾ or due defect in chlorination of well water since the chlorine level sufficient to kill bacteria not affect the cyst of *Entamoeba histolytica*⁽¹¹⁾. Because protozoal cysts are highly resistant to chlorine so these organisms must be removed by coagulation, flocculation, sedimentation and filtration.⁽¹⁸⁾

Regarding clinical picture of bloody diarrhea, amoebic dysentery diarrhea is frequently associated with tenesmus, fever documented in only one third of patients and characteristically absent constitutional symptom and sign.⁽⁶⁾ Our result showed that tenesmus occur in 62 (88.6%) of patients with *Entamoeba histolytica* while fever is documented in only 9 (13%) of patients which is lower than mentioned above, vomiting was found in only 25 (35%) of patients. Bacillary dysentery characteristically have sever abdominal pain, high fever, emesis and generalized toxicity⁽⁶⁾, this confirms result obtained in our study in which fever, tenesmus and vomiting found in 40%, 80% and 90% of patients with bacterial etiology, respectively.

Neurological finding are among the most common extra intestinal manifestation of bacillary dysentery occurring in as many as 40% of hospitalized infected children⁽⁶⁾ Similarly we found that 4 patients (40%) from total of 10 patients with bacterial etiology had convulsion (2 of them had *Shigella*, 1 salmonella, 1 *E. coli*). Breast feeding has been well documented to prevent and attenuate the severity of diarrhoeal diseases in developing countries and against specific enteric pathogens such as shigella sp. *Campylobacter* sp. And enterotoxigenic *E. coli*⁽¹⁹⁾ this agrees with our results in the table (7) which shows significant relation between the type of feeding and enteropathogens isolated from patients with bloody diarrhoea p value=0.017.

The association of fecal leukocyte with organism known to penetrate intestinal mucosa such as salmonella and shigella⁽²⁰⁾ was also noted in this study. This study also showed that the most parasitic infection associated with leukocyte and RBC was amoebiasis, this result is similar to that reported by others who observed that most patient with microscopic RBC and leukocyte

in the stool were most likely infected with *Entamoeba histolytica* ⁽²¹⁾ Presumptive data supporting a diagnosis of bacillary dysentery include demonstration in peripheral blood of leukocytosis with dramatic left shift often with more band than segmented neutrophil. ⁽⁶⁾ WBC and differential count were performed for 106 patients (91.4%) from total of 116, as a result 25 patients (23.5%) have band in their peripheral blood, the culture result of these

patients are shown in table (8) which shows that there are 9 positive cultures, by comparing it with culture results of 10 patients who have no band in their peripheral blood their was highly significant relation between the presence of band in peripheral blood and culture results. From these 25 patients 13 cultures were negative; this is most probably due to antibiotic administration prior to hospitalization.

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Received 12th July .2006 Accepted 24th April 2007