Original
ISSN 2521-8492

Acute Bloody Diarrhea in Children Below Five Years of Age in Babylon Province, Iraq

Basheer Hussien Mugheer Al Mamory*, Asaad Fakhri Hasan Al Obeidi, Ahmed Kamel Tooman Al Kenani

Imam Sadiq Hospital, Directorate of Health, Ministry of Health, Babylon, Iraq.
*Correspondence to: Basheer Hussien Mugheer Al Mamory (E-mail: basheeralmamory@gmail.com)
(Submitted: 03 October 2021 – Revised version received: 11 October 2021 – Accepted: 04 November 2021 – Published online: 26 March 2022)

Abstract
Objectives: The aim of study is to find the causes, how optimal diagnosis and what is the most causative agents of bloody diarrhea in infants and children.
Methods: One hundred children with bloody diarrhea (three or more loose bowel motion/day with visible blood in stool) from total 1660 of gastroenteritis where studied in Babylon hospital for maternity and children in Hilla from (1st of March to 31st August 2012), all of them were less than five years of age. Those with surgical condition excluded from the study.
Results: Higher percentage with *E. histolytica* 50(50%). Their stool culture was showed growth of normal flora. Second microorganism was *E. Coli* 20(20%), Third microorganism was *Shigella* 7(7%). There is no relationship between types of microorganisms in bloody diarrhea and different age group. More than 50% of the patients with bloody diarrhea was found in those who were below 2 years. There is no significant difference between type of microorganisms and gender of the patient's. There is significant difference between total number of cases and gender of the patient's. Male more affected 56(56%) than female 44(44%). There is a significant difference between total number of patients and residence of patients. Patient come from rural area were more 60(60%) than those from urban area 40(40%).
Conclusion: *Entamoeba Histolytica* one of the most frequent offending pathogen in-patient with bloody diarrhea in our society. Children below 2 years are the main affected group and male sex affected more than female.
Keywords: Acute, diarrhea, child, Iraq

Introduction

Diarrheal disease is one of the leading causes of morbidity and mortality in children world-wide, causing one billion episodes of illnesses and 1.8 million deaths annually.[1] Acute bloody diarrhea defined as the abrupt onset of abnormally high fluid content in the stool (more than the normal value of approximately 10 ml/kg/d) with presence of blood.[1] This situation usually implies an increased frequency of bowel movements, which can range from 4–5 to more than 20 times per day. The augmented water content in the stools is due to an imbalance in the physiology of the small and large intestinal processes involved in the absorption of ions, organic substrates, and water.[2,3] Dysentery indicate a condition characterized by bloody diarrhea accompanied by tenesmus.[2,3] It has the same meaning of bloody diarrhea. Although clinical texts often use this term to describe the syndrome of bloody diarrhea with fever, abdominal cramps, rectal pain and mucoid stool, these features do not always accompany bloody diarrhea, and this does not define its etiology or determine appropriate treatment.[3] In 1859, the pathogenecity of *Entamoeba Histolytica* has been verified, and later in 1891, a clear distinction was made between bacillary and amoebic dysentery. Then the bacillus was first described by Shiga in Japan 1898.[1] About 80% of deaths due to diarrhea occur in the first two years of life. The main cause of death from acute diarrhea is dehydration. Other important causes of death are dysentery, malnutrition and serious infection such as sepsis.[2] Bloody diarrhea in young children is usually a sign of invasive enteric infection that carries a substantial risk of serious morbidity and death. Non-infectious causes account for a very small proportion of episodes of bloody diarrhea.[3] About 10% of diarrheal episodes in children under 5 years of age have visible blood in the stool and this account for about 15% of diarrhea-associated deaths in this age group worldwide.[4] Compared with the water diarrhea, bloody diarrhea generally lasts longer, is associated with more complications, is more likely to adversely affect a child growth and has a higher case fatality rate.[5,6] There is also a synergism between bloody and persistent diarrhea accompanied by malnutrition; therefore the control of bloody diarrhea will prevent most of death attributed to malnutrition and persistent diarrhea.[7] *Shigella:* Worldwide distribution, more in developing countries, occurs most often during warm months, sexes are affected equally. Infection can occur at any age, but it is most common in 2nd and 3rd years of life and it is rare in the 1st six months.[8] Contaminated food and water are important vector, many infections of the gastrointestinal tract are spread by fecally contaminated water because the transit time through the stomach is faster for drinks than for foods.[8,9] Other invasive bacteria: enteroinvasive *E. Coli*, enterohemorhagic *E. Coli*, *Campylobacter jejuni* and non typhoidal *Salmonella*. Worldwide distribution, more in developing countries, occurs most often during warm months, sexes are affected equally. The incidence is higher in children less than five years. In Salmonellosis, the highest isolation rate is for infants.[10] The aim of study is to find the causes, how optimal diagnosis and what is the most causative agents of bloody diarrhea in infants and children.

Methods

One hundred children with bloody diarrhea (three or more loose bowel motion/day with visible blood in stool) from total 1660 of gastroenteritis where studied in Babylon hospital for maternity and children in Hilla from (1st of March to 31st

August 2012), all of them were less than five years of age. Those with surgical condition excluded from the study.

Information taken from their parents including;

1. Age, sex and residence.
2. Type of feeding; breast, bottle, mixed, diet.
3. Type of water supply; tap water, river and well.
4. Boiling of the drinking water.
5. Level of education of mother.
6. Degree of socio economic status: high, middle and low socio economic status.

All the patients examined thoroughly looking mainly for the degree of dehydration. Their temperature was measured from the axilla (with adding 0.5°C), regarded feverish if the temperature was 38.3°C. Their weights were measured and plotted on growth chart. Full systemic examination done to all patients. Two direct smears were prepared by mixing a small amount of freshly passed fecal materials (2 g within 30 minutes of defecation), one with saline and other with iodine. The saline preparation was used primarily to detect RBCs, pus cells and motile trophozoites and the iodine preparation was used to detect cysts of *Entamoeba histolytica*. Fresh stool is cultured on MacConkey agar, *Shigella-Salmonella* agar (SS) agar and tetrathionate broth, incubated aerobically for 18–24 hour at 37°C. Growth from tetrathionate broth was subcultured on SS agar for additional 24 hour at 37°C in order to enhance the growth of bacteria and yield better results. For further confirmation of etiological pathogen specific antisera for *Shigella*, *Salmonella* using slide agglutination test was also done. Strain of *E. coli* was not determined whether it is pathogenic or not. Cultures and tests for other causative microorganisms are unfortunately not available in our laboratory. The data were analyzed statistically by using computerized SPSS system version. Chi-square test that was carried out to determine the relative importance of various variables. *P*-value < 0.05 was considered as a statistically significant, and value < 0.01 was considered to be highly significant.

Results

Higher percentage with *E. histolytica* 50(50%). Their stool culture was showed growth of normal flora. Second microorganism was *E. Coli* 20(20%), Third microorganism was *Shigella* 7(7%). As shown in Table 1.

There is no relationship between types of microorganisms in bloody diarrhea and different age group (*P*-value > 0.05). More than 50% of the patients with bloody diarrhea was found in those who were below 2 years (*P*-value < 0.05). As shown in Table 2.

Table 1. **Isolation rate of enteropathogenes in children with bloody diarrhea**

Enteropathogenes isolated	Number and percentage of cases
E. histolytica	50(50%)
E. Coli	20(20%)
Shigella	7(7%)
Salmonella	2(2%)
No isolate	21(21%)

There is no significant difference between type of microorganisms and gender of the patient's *P* > 0.05. There is significant difference between total number of cases and gender of the patient's *P* > 0.05. Male more affected 56(56%) than female 44(44%). As shown in Table 3.

There is a significant difference between total number of patients and residence of patients. Patient come from rural area were more 60(60%) than those from urban area 40(40%). As shown in Table 4.

There is no relationship between type of microorganism and different types of feeding (*P*-value > 0.05). There is relationship between number of cases of bloody diarrhea and different types of feeding showed more patients occur with bottle feeding (*P*-value < 0.05). As shown in Table 5.

Table 2. **Age distribution of the patients according to etiological agents**

Age (months)	Etiological agent			No. of cases
	Bacterial	Amoebic	Unknown	
1–12	5(19.2%)	15(57%)	6(23%)	26
13–24	11(33.3%)	20(60.6%)	2(6%)	33
25–36	6(42.8%)	5(35.7%)	3(21.4%)	14
37–48	5(33.3%)	5(33.3%)	5(33.3%)	15
49–60	2(16.6%)	5(41.6%)	5(41.6%)	12
Total	29	50	21	100

Table 3. **Sex distribution of the patients according to the etiological agents**

Sex	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Male	16(28.5%)	33(58.9%)	7(12.5%)	56
Female	13(29.5%)	17(38.6%)	14(31.8%)	44
Total	29	50	21	100

Table 4. **Distribution of the patients and their etiology of according to the residence of the patients**

Residence	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Urban	9(22.5%)	20(50%)	11(27.5%)	40
Rural	20(33.3%)	30(50%)	10(16.6%)	60
Total	29	50	21	100

Table 5. **Distribution of the patients and their etiology according to the type of feeding**

Type of feeding	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Breast	12(42.8%)	10(35.7%)	6(21.4%)	28
Bottle	7(20.5%)	20(58.8%)	7(20.5%)	34
Diet	5(35.7%)	5(35.7%)	4(28.5%)	14
Mixed	5(20.8%)	15(62.5%)	4(16.6%)	24
Total	29	50	21	100

There is a highly relationship between total number of patients and different types of water supply (*P*-value < 0.01). There is also a relationship between different etiological factors and type of water supply. Tap water associated with amoebic diarrhea than bacterial, (*P*-value < 0.05). As shown in Table 6.

There is a highly relationship between total number of patients and habit of boiling water, showed more patients of bloody diarrhea were using UN boiled water. There is no relationship between different types of microorganism and habit of boiling of water (*P*-value > 0.05). As shown in Table 7.

There is no significant relationship between types of microorganisms and the level of socio economic status. (*P*-value > 0.05). But there is highly significant difference between total number of cases of bloody diarrhea and level of socio economic status. More patients were come from low socio economic status (55%) (*P*-value < 0.01). As shown in Table 8.

There is no significant relationship between types of microorganisms and the level of the education of the mother of the patient (*P*-value > 0.05). But there is significant difference between total number of patients of bloody diarrhea and level of education of the mothers (*P*-value < 0.05). As shown in Table 9.

There is a significant difference according to the number of patients presented with fever between bacterial 25 (86%) than amoebic bloody diarrhea 30(60%), (*P*-value < 0.05). There is a significant difference according to the number of patients presented with vomiting between bacterial 20(69%) than amoebic bloody diarrhea 15(30%), (*P*-value < 0.05). There is a significant difference according to the number of patients presented with abdominal pain between bacterial 26(90%) than amoebic bloody diarrhea 30(60%), (*P*-value < 0.05). There is no significant difference between the number of patients presented with tenesmus between bacterial & amoebic but there is significant difference to those patients of bloody diarrhea in which no isolate in their culture (*P*-value < 0.05). As shown in Table 10.

Discussion

Entameoba Histolytica was the most common isolated pathogen as it was detected in stool sample of half the patient in contrast *shigella* species which are known by many as the most common causative organisms of bloody diarrhea, was detected only in 7% of patients, this finding was similar to that observed in studies conducted in our country,[11] The opposite finding was reported in many studies in different countries which showed that *shigella* species were the most common agent associated with bloody diarrhea,[12,13] the reason for this difference could be explained by the fact that invasive amebiasis is an important public health problem and occur globally in endemic area. The age of the most children was below 2 year, a similar study showed same result by Henry.[14] Susceptibility of this age group to bloody diarrhea may be explained by many factors such as declining level of maternal immunity, introduction of solid food which may be contaminated by enteropathogen, together with introduction of foreign material to the mouth of these children as they have learned to crawl up and pick subjects in

Table 6. **Distribution of the patients and their etiology according to the types of water supply**

Water supply	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Tap water	28(29.7%)	46(48.9%)	20(21.2%)	94
*Other sources	1(16.6%)	4(66.6%)	1(16.6%)	6
Total	29	50	21	100

*(river, irrigation canals, and wells).

Table 7. **Distribution of the patients and their etiology according to the habit boiling water**

Boiling of water	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Yes	8(57.1%)	5(35.7%)	1(7.1%)	14
No	21(24.4%)	45(52.3%)	20(23.2%)	86
Total	29	50	21	100

Table 8. **Distribution of the patients and their etiology according to the level of the socio economic status**

Socio economic status	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Low	15(27.2%)	30(54.5%)	10(18.1%)	55
Middle	10(32.2%)	15(48.3%)	6(19.3%)	31
High	4(28.5%)	5(35.7%)	5(35.7%)	14
Total	29	50	21	100

Table 9. **Distribution of the patients and their etiology according to the level of the education of the mothers of the patients**

Level of education	Etiological agent			No. of patients
	Bacterial	Amoebic	Unknown	
Illiterate	6(26%)	10(43.4%)	7(30.4%)	23
Read and write	3(25%)	5(41.6%)	4(33.3%)	12
Primary school	12(32.4%)	20(54%)	5(13.5%)	37
Preparatory school	6(27.2%)	12(54.5%)	4(18.1%)	22
College or Institute	2(33.3%)	3(50%)	1(16.6%)	6
Total	29	50	21	100

Table 10. **Distribution of the patients and their etiology according to the clinical manifestation**

Clinical presentation	Etiological agent			No	*P*-value
	Bacterial	Amoebic	Unknown		
Fever	25	30	18	73	*P* < 0.05
	86%	60%	86%	73%	
Vomiting	20	15	17	52	*P* < 0.05
	69%	30%	81%	52%	
Tenesmus	14	32	20	71	*P* < 0.05
	65%	64%	95%	71%	
Abdominal pain	26	30	21	77	*P* < 0.05
	90%	60%	100%	77%	

P-value ≤ 0.05 (significant).

their hands by this age, which increases the risk of exposure to fecal pathogens, similar studies support that.[15] Also most of the admitted cases were in this age group, because of high worry of the families toward their children at this age group.[2] Although amoebiasis is seen more in older ages, it could affect neonate, especially those who are bottle fed as in our study we found 40-days old baby with amoebic dysentery. Edward found fulminant amoebic colitis in a 10-day's neonate.[11] Male sex was affected more than female with ratio of (1.3:1). This is in agreement with other studies,[16] this can be explained by that more samples collected in this study were male, and in our society families are more care about their male kids than female, while others studies showed the opposite, which means that the reverse occurred (female affected more than male).[15] A high percentage were bottle fed 34(34%) while breast fed is less 28(28%) and this strengthen the protective value of breast milk against diarrhea, especially bloody diarrhea, similar results were found in other studies.[17,18] The majority of the patients included in the study had tap water supply 94(94%) while other sources is just 6(6%), this occurred due to usage of tap water is highly predominant and there is a little persons who use other sources and we do not know the total number of them, which will lead to few number of children included in this study. However, even chlorination of water can not kill amoebic cyst or some other enteropathogenes this was aided by some studies,[1,16] or it may be due to contamination of water system by ground water was responsible for outbreak of amoebic dysentery.[19] Majority of the patients 86(86%) were consuming un boiled water, which increase the risk of the infection because boiling of water decreases the risk of waterborne enteropathogene transmission by destruct them like ameobic cyst, similar studies support that.[20] High number of cases were come from rural area 60(60%), while just 40(40%) from urban area. And this occurred due to collection of risk factors in this area as poor nutritional history, low socio economic status and the safety of water supply was low in this area due to poor observation because they are remote from the center of the governorate, also the educational level of mothers in general is very low. Also this strengthen by many studies.[1,2] According to the educational level of the mother we see high percentage in those who got primary school and those who were illiterate (37%, 23%) respectively, because mother educational background influence maternal knowledge and practice in health and hygiene and this reflect on occurrence of bloody diarrhea in children,[1] also the variation between levels of education of mothers can be explained according to the sample size which included more mothers from primary school levels in this research. Also this explanation coincide with the explanation of variation of degree of socio economic status and incidence of bloody diarrhea more with low socio economic status (55%) and a less with moderate socio economic status (31%) and least with high socio economic status, just (14%). Low socio economic status leads to irregular primary health attendance and to malnutrition and these factors make family away from health worker instructions and make children vulnerable to occurrence of bloody diarrhea many studies show similar results.[21] Fever was reported in 73% of cases, another study found that 92% of patients with dysentery had fever. It was significantly more frequent and higher with bacterial bloody diarrhea (86%) than amebic bloody diarrhea (60%) and this can be explained due invasion of these pathogen to the wall of intestine and systemic effect of them. This similar to other studies.[13] Tensemus was present in 71% of cases. It occurs in both bacterial and amebic bloody diarrhea with no significant difference. Bin Saeed also noticed tensemus in 69% of cases.[22] Vomiting was more common in patients with bacterial bloody diarrhea (69%) than amebic (30%). This in agreement with other studies.[23] Abdominal pain was present in 77% of cases and was more significant in bacterial (90%) than amebic 60%, this can be explained due systemic effect of this pathogen that cause bloody diarrhea many studies found similar results.[18]

Conclusion

Entamoeba Histolytica one of the most frequent offending pathogen in-patient with bloody diarrhea in our society. Children below 2 years are the main affected group and male sex affected more than female. Bottle feeding preference, poor nutritional status, low socio economic status, non-boiling of drinking water and presence of domestic animals in the houses make children more prone to have bloody diarrhea. Low educational level of the mothers makes their children more prone to have bloody diarrhea. Tap water sometimes may carries pathogen that cause bloody diarrhea. Rural areas still have the high number of cases of bloody diarrhea than urban areas. Fever, vomiting and abdominal pain are the most prominent feature of acute bloody diarrhea of bacterial etiology.

Conflicts of Interest

None.

References

1. Pickering, L.K., and Snyder, J. D., Gastroenteritis. In: Behrman, R. E., Kligman, R. M., and Jenson, H. B., (eds). Nelson text book of pediatrics, 18th ed. Pheladelphia, W. B. Saunders Company, 2007, chap. Page 1369.
2. World Health Organization. Reading on diarrhea. Student manual. WHO/Geneva, 1992.
3. Victora, C. G., Huttly, S. R. A., Fuchs, S. C., et al. International differences in clinical patterns of diarrheal deaths: a comparison of children from Brazil, Senegal, Bangladesh and India. J. diarrheal Dis. Resources 1993;11:25–29.
4. Black, R. E., Brown, K. H., Becker, S., et al. Longitudinal studies of infectious disease and physical growth of children in rural Bengladesh. Am J Epidemiology. 2000;115:315–324.
5. Ronsmans, C., Bennish, M. L. and Wierzba, T. Diagnosis and management of dysentery by community health workers. Lancet 1988;2:552–55.
6. Briend, A., Hasan, K. Z., Aziz, K. M. et al. Are diarrhea control programs likely to reduce childhood malnutrition? Observation from rural Bangladesh. Lancet 1989;2:319.
7. Henry, F. S. The epidemiological importance of dysentery in community. Rev. Infectious diseases 2002;4:3000–44.
8. Veinh, H., Wain, J., Chinh, M. T., et al. Treatment of bacillary dysentery in Vitnamese children trop. Med. Hyy. 2000;94:324–326.
9. DeWitt TG.: Acute diarrhea in children. Pediatr Rev 1989;11:6–13 [Published erratum in Pediatr Rev 1989;11:124].
10. AAP. 1997 Red Book. Report of the Committee on Infectious Disease. 24th ed. Elk Grove Village, IL: AAP; 1997.
11. Edward, S., Almuck, J., and Alani, W. Epidemiology of bloody diarrhea. Iraq. j. Com. Med, 2000;13.
12. Vanessa Costa Soares, MD; Acute diarrhea in Infants part 1; published by Medstudents' Homepage 2008.
13. Khalil K., Khan S.R., Mazhar K., et al. occurence and susceptibility to antibiotic of *shigella* species in stoolof hospitalized children with bloody diarrhea in Pakistan. AM-J-Tropmed-hyg 1998;58(6).

14. Henry, F. S. The epidemiological importance of dysentery in community. Rev. Infectious diseases 2002;4:3000–44.
15. Townes. J. M., Quick, R., Gonzales, O. Y., et al. etiology of bloody diarrhea in Bolivian children implication for empiric therapy. J. infectious disease 1997; 175:1527–230.
16. Huilan, S., Zhen, L. G., Mathan, N. M., et al. Etiology of acute diarrheoa among children in developing countries: a multicenter study in five countries. Bull World Health Organization1991;69;549–55.
17. Walsh, J. A., problems in recognition and diagnosis of amebiasis. REV.INF, DIS,1986;8:228.
18. Midzi, S. M., Tshimanga, M., Siziya, S., et al. An out break of desentery in arural district of Zimbabwe: the role of personal hygiene at public gatherings. Cent. Afr. J. Med. 2000 Jun:150–30.
19. Teklemariam, S., Getaneh, T., Bekele, F. Environmental determinant of diarrheal morbidity in under five years children, Keffasheka zone, West Ethiopia. Med. J 2000 Jan;38(1):27–34.
20. Stefano Guandalini, MD, Director, University of Chicago.: diarrhea, article published in Apr 25, 2008. www.eMedicine.com.
21. Reid, S. R., Bonadio, W.A. Outpatient rapid intravenous rehydration to correct dehydration and resolve vomiting in children with acute gastroenteritis. Ann. Emerg. Med. 1996;28:318–23.
22. Bin Saeed A.A.A., El Bushra, H.E. Does treatment of bloody diarrhea due to *Shigella dysenteriae* type 1 with ampicilline precipitate hemolytic uremic syndrome? Gastroenterology J. 1995 Oct – Dec: 1(4):31–33.
23. Guandalini S. Treatment of acute diarrhea in the new millennium. J Pediatr Gastroenterol Nutr. May 2000;30(5):486–9.