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BLOODY DIARRHEA AMONG UNDER FIVE YEAR'S CHILDREN

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ABSTRACT

Background: Dysentery is defined as the presence of fecal blood and mucus, associated with frequent, small loose bowel movements, fever is often present. It results from microbial invasion of colonic mucosa, with mucosal and sub-mucosal inflammation and destruction. Shigellosis is a classic cause of acute dysentery. It has a more harmful effect on nutritional status than acute watery diarrhea. **Aim of the study:** To find out the effect of sociodemographic characteristics parents on bloody diarrhea, most common causative agents in children, the association of breast and bottle feeding and their relation to bloody diarrhea. **Patients and Methods:** Case-control study including 164 children with bloody diarrhea and 100 children with watery diarrhea (as controls) under 5 years were studied prospectively in ALkhansaa Teaching Hospital and Ibn-Sena Teaching Hospital in Mosul from first of February to the 31 of December 2012. **Results:** Entamoeba histolytica was the more common isolated pathogen. It was identified in 63(38.4%) followed by shigella 11(6.7%) then the least was salmonella 6(3.65%) among cases. Infant age was 0-12 month which was the most vulnerable age group (42.6%), males were more affected than females (1.6:1). Urban area found in (58.5%), bottle feeding in (35.4%), while breast feeding is (12.2%), most of them had tap water supply (82.9%), while the other is (17.1%), but (79.3%) not boiling the drinking water. The growth percentage of patients below 5^{th} centile is (60.9%). No dehydration which is more common (46.3%). Illiterate parents were more common (73.2%). Frequent bowel motion of more than 10 time /day was reported in (40.2%) of cases. leukocytosis was found in (40.0%) of cases, while in amebic bloody diarrhea was (2.6%). **Conclusions:** The study concludes that the infants 0-12 months old are the main affected group mostly males. *Entamoeba histolytica* remains the most frequent pathogen. Bottle feeding and non-boiling of water enhance bloody diarrhea while high educational status decreasing the infection.

KEYWORDS: Bloody diarrhea, Shigella, Under 5 children.

INTRODUCTION

Diarrhea is best defined as excessive loss of fluid and electrolyte in the stool. Acute diarrhea is defined as sudden onset of the excessively loose stools of >10 g/kg/day in infants and >200 g/24 hr. in older children, which lasts <14 days. When episode lasts >14 days, it is called chronic or persistent diarrhea.[1]

Acute gastroenteritis is a common infection, with an estimated two to three episodes per year occurring in preschool children. Only a small percentage of children with gastroenteritis required hospitalization, but in the United States, more than 4 million children receive medical care for this illness annually, with more than 200,000 hospitalizations and approximately 300 deaths each year. Causes of infectious diarrhea include bacteria, viruses, and parasites, as well as preformed toxins produced by bacteria.[2]

Dysentery is defined as the presence of fecal blood and mucus, associated with frequent, small loose bowel movements, fever is often present. Dysentery is the result of microbial invasion of the colonic mucosa, with mucosal and sub-mucosal inflammation and destruction. Shigellosis is a classic cause of acute dysentery. Dysentery is especially severe in infants and in children who are malnourished, develop evident dehydration during their illness, or are not breast-fed. It also has a more harmful effect on nutritional status than acute watery diarrhea. Dysentery occurs with increased frequency and severity in children who have measles or have had measles in the preceding month, and diarrheal episodes that begin with dysentery are more likely to become persistent than with watery stools.[2,3]

Causes of bloody diarrhea

A number of pathogens can cause bloody diarrhea in preschool children, such as Campylobacter, Shigella, Escherichia coli, Salmonella, Yersinia, Clostridium difficile, and Entamoebahistolytica. Neisseria gonorrhea, Chlamydia trachomatis, and Herpes simplex virus (HSV) also occasionally produce bloody stools. Infection should be considered in children presenting with blood in stool accompanied by dysenteric symptoms (e.g., fever, abdominal pain, tenesmus, small volume bloody stools).[4,5]

Clinical Features

The clinical diagnosis of dysentery is based solely on the presence of visible blood in the diarrheal stool. The stool will also contain numerous pus cells which are visible with a microscope, and it may contain large amounts of mucus; these latter features suggest infection with a bacterial agent that invades the intestinal mucosa (such as *Campylobacter jejuni*or *Shigella)*, but alone are not sufficient to diagnose dysentery.[6]

In some episodes of shigellosis, the stool is initially watery, becoming bloody after 1 or 2 days, this watery diarrhea is sometimes severe and may cause dehydration. Patients with dysentery frequently have fever, but sometimes the temperature is abnormally low, especially in the most serious cases. Cramping abdominal pain and pain in the rectum during defecation, or attempted defecation (tenesmus), are also common; however, young children are unable to describe these complaints.[7]

Complications

A number of severe and potentially fatal complications can occur during dysentery, especially when the cause is *Shigella.* They include intestinal perforation, toxic mega colon, rectal prolapse, convulsions (with or without a high fever), septicemia, haemolytic-uraemic syndrome, and prolonged hypernatremia.[8]

Major complication of dysentery is weight loss and rapid worsening of nutritional status. This is caused by anorexia, the body's increased need for nutrients to fight infection and repair damaged tissue, and the loss of serum protein from the damaged intestine. Death from dysentery is usually caused by extensive damage to the ileum and colon, complications of sepsis, secondary infection (e.g. pneumonia), or severe malnutrition.[8,9]

Children convalescing from dysentery are also at increased risk of death from other infections, owing perhaps to their poor nutritional state or impaired immunity. Complications vary widely according to the causative pathogens of bloody diarrhea.[9]

Diagnosis

A number of diagnostic tests for bacterial and parasitic enteropathogens are available in most clinical laboratories.[10]

1. General stool examination

Stool specimens should be examined for mucus, blood, and leukocytes. Fecal leukocytes are indicative of bacterial invasion of colonic mucosa.[11]

2. Stool and body fluid cultures

Confirmation of the infecting organism can be made only by culture of the stool. Shigella, salmonella, campylobacter species and yersinia can be identified via different types of non-selective or selective media. Other specimens which should be considered for culture include blood, throat, wounds, and specimens obtained at surgery such as the appendix or lymph nodes.[12]

3. Antigenic and serologic tests

Various tests used for identifying different pathogens like fecal and serum antigen detection assays that use monoclonal antibodies to bind to epitopes present on pathogenic E. histolytica strains but not on nonpathogenic E. dispar or E. moshkovskii strains, are now being used commercially to detect E. histolytica infection. Antigen detection kits using either enzyme linked immunosorbent assay (ELISA), radioimmunoassay or immunofluorescence has been developed.[13,14]

4. Polymerase chain reaction (PCR)

It may offer a rapid alternative diagnostic tool for shigella, salmonella, EHEC and E.histolytica but is as yet not in widespread use in clinical settings. Real-time polymerase chain reaction (PCR) using primers targeting a region of the toxin B gene could be a useful tool for diagnosis of *C.difficile* infection.[15]

5. Visual inspection of the colon

Sigmoidoscopy and/or colonoscopy can be performed either to make the diagnosis of amebiasis or to exclude other causes of the patients' symptoms.[16]

Treatment

Children with dysentery should be presumed to have shigellosis and treated accordingly. This is because shigellae cause about 60% of dysentery cases worldwide seen at health facilities and nearly all cases of severe, life-threatening disease. If microscopic examination of the stool is performed and trophozoites of E. *histolytica*containing erythrocytes are seen, antiamoebic therapy should also be given. The five key components of dysentery reatment are fluids, feeding, antimicrobials, supportive therapy, and follow-up.[17,18]

Prevention

In many developed countries, diarrhea due to *Clostridium difficile*, *E. coli* 0157: H7, *Salmonella* and *Shigellae arenotifiable* diseases and, thus, contact tracing and source identification is important in preventing outbreaks.[19] The prevention includes promotion of exclusive breast-feeding, improved complementary feeding practices, improved water and sanitary facilities and promotion of personal and domestic hygiene, improved case management of diarrhea, control animal exposure, control of transfusion-transmitted infection, and antibiotic restriction.

Aim of the Study

To find out the effect of sociodemographic characteristics parents on the condition of bloody diarrhea, most common causative agents of bloody diarrhea in children, the association of breast and bottle feeding and their relation to bloody diarrhea.

PATIENTS AND METHODS

Cases control stud design including 164 children with bloody diarrhea (three or more loose bowel motions with visible blood in stool) and 100 children with acute watery non-bloody diarrhea from the same age group were taken as a control group. The sample was studied in Al-Khansaa Teaching Hospital children and Iben-Sena Teaching Hospital in Mosul from the 1st of February to the 31st of December 2012.

All of the patients were less than five years of age and verbal consents were taken from the parents. Those with surgical condition and those who were immunocompromised were excluded from the study.

Information was taken from their parents including age, sex and residence, and educational state of the parents. Frequency, presence of blood/mucous, vomiting, fever, tenesmus, rectal prolapse and convulsion were asked about in addition to type of feeding whether breast, bottle, and mixed and type of family food. Type of water supply whether tap water or other sources (river, tanker or wells) in addition to history of boiling the drinking water was assessed**.**

All the patients were examined thoroughly looking mainly for the signs and degree of dehydration. Their temperature was measured from the axilla (with adding 0.5 c̊) and those with temperature more than 38.5c̊ regarded as having high-grade fever and those less than 38.5c̊ regarded as having low-grade fever.

For patients aging between 0 to 24 months their weights were measured and plotted on weight for age chart, while patients between 25 to 60 months old their weight and height were measured and BMI was calculated. Full systemic examination was done to all patients.

Methods

Two fresh stool samples were collected from these patients and sent to the laboratory one for general stool examination and other for stool culture.

General Stool Examination

Two direct smears were prepared by mixing a small amount of freshly passed fecal materials (2g within 30 minutes of defecation), one with saline and other with iodine. The saline preparation was used primarily to detect RBCs, pus cell and trophozoites, and the iodine preparation was used to detect cysts of *Entamoebahistolytica*.

Stool Culture

Fresh stool is cultured on MacConkey agar, Shigella-Salmonella (SS) agar and tetrathionate broth, incubated aerobically for 18-24 hours at 37c̊. Growth from tetrathionate broth was subcultured on SS agar for additional 24 hours at 37c̊ in order to enhance the growth of bacteria and yield better results.

Strains of *E. coli* could not be determined whether they are pathogenic or not so were not counted in the documented etiological factors of bloody diarrhea in this thesis. Cultures and tests for other microorganisms (e.g. Campylobacter and Yersinia species) are unfortunately not available in the laboratory.[58]

It is important to mention that in the analysis of clinical features of amebic bloody diarrhea we took only those with *Entamoeba histolytica* trophozoite in their general stool examination, in order to have, as much as possible, a correct diagnosis of amebic dysentery.

2.3 Statistical Analysis

The data were analyzed statistically by SPSS-26 and Chi-square test was carried out to determine the relative importance of various variables. P value ≤ 0.05 was considered as statistically significant.

RESULTS

Table (1) showed the distribution of the cases with bloody diarrhea and control group according to the age group and demonstrated that children under 12 months old are at more risk to develop bloody and watery diarrhea 42.6% versus 34% respectively with no statistically significant difference (p=0.124). Also amebic and bacterial infections occur more in this age group with no statistical significant difference (p=0.161).

Table 1: Distribution of the cases with bloody diarrhea and control group according to the age group.

Age (Months)	*Bloody diarrhea*				*Watery diarrhea*
	Bacterial	*Amebic*	*Others*	*Total*	
0-12months	14(46.7)	24(31.6)	32(55.1)	70(42.6)	34(34.0)
13-24 months	6 (20.0)	18(23.7)	8(13.8)	32(19.5)	27(27.0)
25-36 months	6(20.0)	14(18.4)	8(13.8)	28(17.1)	16(16.0)
37-48 months	2(6.7)	12(15.8)	2(3.4)	16(9.8)	14(14.0)
49-60 months	2(6.7)	8(10.5)	8(13.8)	18(11.0)	9(9.0)
Total	30	76	58	164	100

Table (2) demonstrated the isolation rate of Enteropathogens in children with bloody diarrhea and it was detected in 108 (65.85%) cases and identified as 63(38.4%) of patients had *Entamoeba histolytica* trophozoites and their stool culture revealed no growth or growth of normal flora, Shigella species in 11 (6.7%) cases and non typhoidal salmonella in 6(3.65%) cases. Fifty six (34.15%) of cases their stool culture had no pathogenic bacteria.

Table (2): Isolation rate of Enteropathogens in children with bloody diarrhea.

Enteropathogens isolated	*Number*	*Percentage*
E.histolytica (trophozoite)	63	38.4
E.histolytica (cyst)	28	17.1
Shigella	11	6.7
Salmonella	6	3.65
Others	56	34.15
Total	164	100

Table (3) demonstrated the relation between the causes of bloody diarrhea and watery diarrhea and the sex and found that the male patients with bloody diarrhea 100(61.0%) were more than female patients with bloody diarrhea 64 (39.0%) with male to female ratio 1.56:1, when compared with the cases of watery diarrhea it showed no statistical significance (p=0.523). In the same manner, male patients are more prone to have *Entamoeba histolytica* infection 50(65.8%) than female patients 26(34.2%) with male to female ratio 1.9:1, this sex difference is more obvious than in bacterial infection with no statistical significant difference (p=0.07).

Table (3): The relation between the causes of bloody diarrhea and watery diarrhea and the sex.

Sex	**Bloody diarrhea**				**Watery diarrhea**
	Bacterial	**Amebic**	**Others**	**Total**	
Male	14(46.7)	50(65.8)	36(62.0)	100(61.0)	57(57.0)
Female	16(53.3)	26(34.2)	22(38.0)	64(39.0)	43(43.0)
Total	30	76	58	164	100

Table (4) demonstrated the relation between the causes of bloody diarrhea and watery diarrhea and patients' residence and showed that the majority of patients with bloody diarrhea (58.53%) came from urban areas, with no statistically significant difference between types of diarrhea (p=0.941), on the other hand *Entamoeba histolytica* is more common in urban areas (63.1%) in contrast to bacterial etiology (26.7%) with statistical significant difference (p=0.001).

Table (4): The relation between the causes of bloody diarrhea and watery diarrhea and patients' residence.

Residence	**Bloody diarrhea**				**Watery diarrhea**
	Bacterial	**Amebic**	**Others**	**Total**	
Urban	8(26.7)	48(63.1)	40(69.0)	96(58.5)	59(59.0)
Rural	22(73.3)	28(36.9)	18(31.0)	68(41.5)	41(41.0)
Total	30	76	58	164	100

Table (5) demonstrated the relation between the etiology of bloody diarrhea and watery diarrhea with type of feeding and showed that the patients on solid food were more vulnerable to have bloody diarrhea (37.8%) and watery diarrhea (39.0%) and the patients on bottle feeding were more vulnerable to have bloody diarrhea (35.4%) and watery diarrhea (36.0%) than patients on breast feeding (12.2% and 11.0% respectively), but there was no statistical significant difference (p=0.779). Also patients on bottle feeding were more vulnerable to have amebic rather than bacterial bloody diarrhea with no significant statistical difference (p=0.826).

Table (5): The relation between the etiology of bloody diarrhea and watery diarrhea with type of feeding.

Type of feeding	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
Breast	6(20.0)	4(5.3)	10(17.2)	20(12.2)	11(11.0)
Bottle	10(33.3)	30(39.5)	18(31.0)	58(35.4)	36(36.0)
Mixed	4(13.3)	8(10.5)	12(20.8)	24(14.6)	14(14.0)
Solid food	10(33.3)	34(44.7)	18(31.0)	62(37.8)	39(39.0)
Total	30	76	58	164	100

Table (6) demonstrated the relation between the etiology of bloody diarrhea and watery diarrhea with water supply most of the cases of bloody and watery diarrhea received tap water (82.93% and 79.0% respectively) and there was no statistically significant difference (p=0.426), also there was no statistically significant difference between causative agents of bloody diarrhea (p=0.904).

Table (6): The relation between the etiology of bloody diarrhea and watery diarrhea with water supply.

Water supply	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
Tap water	24(80.0)	60(79.0%)	52(89.7)	136(82.9)	79(79.0%)
Other sources*	6(20.0)	16(21.0)	6(10.3)	28(17.1)	21(21.0)
Total	30	76	58	164	100

*** Rivers, wells or irrigation canals.**

Table (7) demonstrated the relation between the etiology of bloody diarrhea and watery diarrhea and the habit of boiling of water and found that the majority of patients with bloody and watery diarrhea did not boil their water used for feeding (79.26% and 64% respectively) but more susceptible to have bloody rather than watery diarrhea with statistically significant difference (p=0.006), boiling habit differ among etiological factors of bloody diarrhea more in bacterial then amebic with no statistical significant difference (p=0.095).

Table (7): The relation between the etiology of bloody diarrhea and watery diarrhea and the habit of boiling of water.

Boiling of water	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
Yes	8(26.7)	10(13.1)	16(27.6)	34 (20.7)	36(36.0)
No	22(73.3)	66(86.9)	42(72.4)	130(79.3)	64(64.0)
Total	30	76	58	164	100

Table (8) demonstrated the relation between the causes of bloody diarrhea and watery diarrhea and the frequency of bowel motion/day and revealed that the patients with bloody diarrhea had tendency to have less bowel motions per day than patients with watery diarrhea with no statistically significant difference (p=0.659), however patients with bacterial bloody diarrhea had a higher frequency of bowel motions (60.0% of them have >10/day) than those with amebic bloody diarrhea (31.6%) with statistically significant difference (p=0.007).

Table (8): The relation between the causes of bloody diarrhea and watery diarrhea and the frequency of bowel motion/day.

Frequency of bowel motion/day	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
<5	2(6.7)	20(26.3)	14(24.1)	36(22.0)	15(15.0)
5-10	10(33.3)	32(42.1)	20(34.5)	62(37.8)	42(42.0)
>10	18(60.0)	24(31.6)	24(41.4)	66(40.2)	43(43.0)
Total	30	76	58	164	100

Table (9) demonstrated the other clinical manifestations of bloody diarrhea and watery diarrhea and showed that 33.0% of patients with watery diarrhea had severe dehydration while 15.9% of patients with bloody diarrhea had severe dehydration, with a high statistically significant difference (p=0.001). On the other hand

26.7% of patients with bacterial bloody diarrhea had severe dehydration while 13.2% of patients with amebic bloody diarrhea had severe dehydration, with no statistically significant difference (p=0.095).

Table (9): The relation between the degree of dehydration and the causes of bloody diarrhea and watery diarrhea.

Dehydration	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
No dehydration	6(20.0)	48(63.1)	22(37.9)	76(46.3)	15(15.0)
Mild to moderate	16(53.3)	18(23.7)	28(48.3)	62(37.8)	52(52.0)
Severe dehydration	8(26.7)	10(13.2)	8(13.8)	26(15.9)	33(33.0)
Total	30	76	58	164	100

Table (10) demonstrated the relation between the etiology of bloody diarrhea and watery diarrhea and the educational status of the parents and showed that the most of the cases of bloody and watery diarrhea had no or low education (73.2% and 79.0% respectively) and there was no statistically significant difference (p=0.286), also there was no statistically significant difference between causative agents of bloody diarrhea (p=0.734).

Table (10): The relation between the etiology of bloody diarrhea and watery diarrhea and the educational status of the parents.

Status of education	Bloody diarrhea				Watery diarrhea
	Bacterial	Amebic	Others	Total	
Uneducated	20(66.7)	48(63.2)	52(89.7)	120(73.2)	79(79.0)
Educated	10(33.3)	28(36.8)	6(10.3)	44(26.8)	21(21.0)
Total	30	76	58	164	100

Table (11) demonstrated the relation between WBC count and the causes of bloody diarrhea and revealed that the patients with bacterial bloody diarrhea had higher rate of leukocytosis (40.0%) in comparison with only 2.6% of patients with amebic bloody diarrhea with a high statistically significant difference (p=0.002).

Table (11): The relation between WBC count and the causes of bloody diarrhea.

WBC Count	Bacterial	Amebic	Others	Total
>15000	12(40.0)	2(2.6)	4(6.9)	18(11.0)
<15000	18(60.0%)	74(97.4)	54(93.1)	146(89.0%)
Total	30	76	58	164

DISCUSSION

The study revealed that *Entamoeba histolytica* trophozoite was the most common isolated pathogen as it was detected in stool samples of (38.4%) of the patients. In contrast, Shigella species which are known as the most common causative agent of bloody diarrhea was detected only in (6.7%) of patients. This finding was near similar to that observed in studies conducted in Iraq by Alaa *et al.,*[20] which shows *Entamoeba histolytica* trophozoite 24.6% versus Shigella species 10.6%), and Basheer *et al.,*[21] which shows 50.0% versus 7.0% respectively.

The opposite finding was reported in many studies in different countries which showed that shigella species were the most common agents associated with bloody diarrhea including Ronsmans *et al,*[22] which shows *Entamoeba histolytica* trophozoite 30% versus Shigella species 50%, and Townes *et al.,*[6] which shows 7% versus 29% respectively. The reason for this difference could be explained by the fact that invasive amebiasis is an important public health problem and occurs globally in endemic area.

Entamoeba histolytica cyst was found in 7(25%) of bacterial bloody diarrhea, and other 21(75.0%) patients had *Entamoeba histolytica* cyst with negative stool culture. This means that more than one pathogen may be isolated from patients with bloody diarrhea. This is in agreement with studies done by Alaa *et al.,*[20] (46.3%), and Lai-SW *et al.,*[23] (13.1%).

It was not possible to identify the causative agent in 56 cases (34.15%). This is in agreement with other studies like Alaa *et al.,*[20] (15.5%), and Basheer *et al.,*[21] (21.0%). This could be due to infection with other organisms not routinely investigated in the stool samples or due to the lack of sensitivity of some laboratory procedures.

The study showed most common age of presentation of bloody diarrhea was under 1 year 70 cases (42.6%). A similar showed same results by Basheer *et al.,*[21] (59.0%). Other studies support that like Khan *et al*.,[9] and Ahmed *et al.*[10] Susceptibility of this age group to bloody diarrhea may be explained by many factors. introduction of bottle feeding and solid food which may be contaminated by Enteropathogens, together with introduction of foreign material to the mouth of these children as they have learned to crawl up and pick subjects in their hands by this age, which increases the risk of exposure to fecal pathogens. Other possible explanation was that most of the admitted cases were in this group, because of high worry of the families toward their children at this age group.

Male sex was affected more than female with 1.5:1. This is in agreement with other studies Alaa *et al.,*[20] (1.6:1), and Basheer *et al.*,[21] (1.3:1), however, El Arifeen *et al.,*[24] found gender-stratified global prevalence rates for pediatric diarrhea to be similar.

More than half of the patients (58.5%) were from urban area. Because they were collected from Children Teaching Hospital/ Medical City inside Mosul city. This is in agreement with Alaa *et al.*,[20] (57.0%), but disagrees with Basheer *et al.*,[21] (40%).

The majority of the patients included in the study had tap water supply (82.93%) which is in agreement with Alaa *et al.,*[20] (82.4%). However, even chlorination of water cannot kill amebic cyst or some other Enteropathogens.

Majority of the patients with bloody diarrhea (79.26%) were consuming unboiled water. A similar result was found by Alaa *et al.*,[20] (82.3%), and Maurer *et al.*,[25] (80.3%), who showed that the risk of illness was significantly higher among those who had drink unboiled water. Also it is known that boiling of water decreases the risk of water-borne Enteropathogens transmission.[13]

Frequency of bowel motion more than 10 times/day was not significant between watery diarrhea (43%) and bloody diarrhea (40.2%) which was more obvious in Alaa *et al.,*[20] (56% versus 38.7% respectively). However, (60%) of those with bacterial bloody diarrhea had more than 10 times bowel motions per day, while those with amebic dysentery had 5-10 times bowel motions per day in(31.6 %) which is in agreement with Alaa *et al*.,[20] (65.8% versus 48.5% respectively).

Severe dehydration was more evident in those with watery diarrhea (33.0%) than in those with bloody diarrhea (15.9%). This may be due to the pattern of bowel motion in amebic bloody diarrhea (the most common cause of bloody diarrhea) which is small volume and less frequent per day. However severe dehydration was more in those with bacterial bloody diarrhea than amebic bloody diarrhea probably because of higher frequency bowel motion and higher fever in patients with bacterial bloody diarrhea. This is in agreement with Alaa *et al.*,[20] who found severe dehydration in 36%, 9.09%, 12.2% and 2.85% of watery diarrhea, bloody diarrhea, bacterial bloody diarrhea and amebic bloody diarrhea respectively.

The weight for age of 60 cases (36.59%) with bloody diarrhea aging 0-24 months was below the 5^{th} centile, and the body mass index (BMI) of 40 cases (24.39%) aging 25-60 months was below 18.5 kg/m2 which indicates their poor nutritional status, and this made them more susceptible to have bacterial and amebic bloody diarrhea. This is in agreement with Alaa *et al.*,[20] who found 39.4% of cases aging 2-24 months have weight for age below 5^{th} centile.

Leukocytosis was found in 18(10.9%) of patients with bloody diarrhea mostly of bacterial rather than amebic bloody diarrhea (40% versus 2.6% respectively), similar to the fact reported by Campbell *et al.,*[18] and Theresa *et al.,*[26] who claimed that shigella, Entero-invasive *E.coli*, and enterohemorrhagic *E.coli* can cause leukocytosis and even Leukomoid reaction > 50000 WBC is reported in 10% of patients with bacillary dysentery), and nearly similar to results of Alaa *et al.,*[20] (24.4%).

CONCLUSIONS

The current study concludes that the infants 0-12 months old are the main affected group; male is affected more than female. The *Entamoeba histolytica* remains the most frequent offending pathogen in patients with bloody diarrhea in the studied group. The Bottle feeding and non-boiling of ingesting water have been affected children to be extra prone to bloody diarrhea. Educational status helps in decreasing the number which affected by bloody diarrhea among those who have better education.

Recommendations

1. Encouraging exclusive breast feeding for the 1^{st} 6 months of life.
2. Boiling of water used for feeding in the 1^{st} 2 years of life.
3. Improving the standard of sanitation and proper disposal of the sewage system.
4. Improving the standard of personal hygiene, together with health education about cleanliness, hand washing, proper cooking and pasteurization of milk with mass media TV education.
5. Supplying the laboratories with more advanced facilities to achieve more accurate diagnosis and follow up.
6. Further studies are needed to identify other causative agents of bloody diarrheas *campylobacter jejuni*, *Yersinia enterocolitica* and *enterohemorrhagic E.coli*
7. More experts are needed in the laboratories to discover the pathogens.

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