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BLOODY DIARRHEA IN CHILDREN UNDER TWO YEARS OF AGE IN MOSUL PROVINCE

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ABSTRACT

Background: Diarrhea is one of the main causes of morbidity and mortality in children globally, resulting in one billion bouts of sickness and 1.8 million deaths per year. Bloody diarrhea often lasts longer than water diarrhea, is linked to more complications, is more likely to negatively impact a child's growth, and has a higher death rate. **Objectives:** Is to identify the most common causative agent of bloody diarrhea in children under 2 years of age, to find the important factors which predispose children to have bloody diarrhea and to throw a light on the main clinical feature of bloody diarrhea in Mosul province. **Methods:** A case-control study. The case group includes one hundred-forty-two children with bloody diarrhea (three or more loose bowel motions with visible blood in stool) were studied in Al-Salam Teaching Hospital in Mosul from the 15th of March to the 31th of December 2024. Those who had received antibiotics during their present illness and those with surgical conditions were excluded from the study. The questionnaire form includes six parts. Part one for socio-demographic information. Part two for patients' chief complaint and its associated symptoms. Part three for patients' type of feeding: breast, bottle, mixed and family food. Part four for type of water supply. Part five for physical examination findings. Part six for laboratory investigations including; stool cultures and tests, peripheral WBC count. The control group includes one hundred children with acute watery non-bloody diarrhea from the same age group and took from the same hospital. Stool culture and peripheral WBC count not done in the control group. Comparison with the control group was limited to risk factors and clinical features. **Results:** Enteropathogens were detected in stool of 120 (84.5%) subjects and identified as follows; 79 (55.6%) subjects of them had *Entamoeba histolytica*. Moreover; 17 (12%) subjects had *E. coli*, 15 (10.6%) subjects had *shigella* and 9 (6.3%) subjects non-typhoidal *salmonella*. Comparison between patients with Bloody diarrhea (bacterial, amebic, unknown source of infection) and those with watery diarrhea shows statistically significant difference between the two groups regarding weight for age (P value = 0.03), boiling of water (P value = 0.009), and history of animal contact (P value = 0.001), frequency of bowel motion (P value = 0.02), dehydration (P value <0.001), presence of fever (P value <0.001), tenesmus (P value <0.001), vomiting (P value = 0.002), rectal prolapse (P value <0.001) and convulsion (P value <0.001). Lastly; it's evident that a statistically significant difference was found between patients bacterial, amebic and unknown cause of bloody diarrhea regarding their WBC counts. (P value <0.001). **Conclusion:** *Entamoeba histolytica* is the most common infection responsible for bloody diarrhea in Iraqi children ages less than 2 years. Children are more likely to develop bloody diarrhea if they have a poor nutritional condition, drinking non boiled water, or have domestic animals in their home. Bacterial bloody diarrhea is associated with higher peripheral leukocytosis than amebic bloody diarrhea. Encouragement of breast feeding and boiling of water reduces the danger of enteropathogen spread.

KEYWORDS: Blood, Iraq, Loose stool, Mosul, Pediatrics.

1. INTRODUCTION

Diarrhea is one of the main causes of morbidity and mortality in children globally, resulting in one billion bouts of sickness and 1.8 million deaths per year.[1] Acute bloody diarrhea can be defined as the sudden beginning of excessively high fluid content in the stool in the presence of blood.[2] This often indicates an increase in the frequency of bowel motions, which can range from

4-5 to more than 20 times each day.[3] The increased water content in the stool attributed to a physiologic imbalance between the small and large intestine processes involved in the absorption of ions, organic substrates, and water.[4-5] Dysentery is a condition defined by bloody diarrhea and tenesmus. It has the same meaning as "bloody diarrhea".[6] Although this term is frequently used in clinical settings to describe the syndrome of bloody diarrhea with fever, abdominal cramps, rectal pain, and mucoid stool, this symptom does not always accompany bloody diarrhea, and does not define its etiology or determine appropriate treatment.[6-7]

Dehydration is the leading cause of death associated with acute diarrhea. Dysentery, malnutrition, and serious infections like sepsis are other significant causes of death.[8-9] Bloody diarrhea in young children is typically indicative of an invasive enteric infection, which has a high risk of significant morbidity and mortality.[10] Only a very small percentage of bloody diarrhea episodes are caused by non-infectious reasons.[11] Bloody diarrhea often lasts longer than water diarrhea, is linked to more complications, is more likely to negatively impact a child's growth, and has a higher death rate.[12] There is also a synergistic relationship between bloody and persistent diarrhea and malnutrition; hence, controlling bloody diarrhea will reduce the majority of deaths caused by malnutrition and persistent diarrhea.[13]

One of the causative micro-organisms is *Shigella* which is found over the world, but is more prevalent in poverty areas. It is most common during the warm months and affects both sexes equally.[14] Although shigellosis infection can happen at any age, it rarely occurred in the first six months of life and most prevalent in the second and third years.[15] Contaminated food and water are major vectors for Shigella; as several gastrointestinal diseases which transmitted by fecally contaminated water because fluids pass through the stomach faster than foods.[16] Other invasive bacteria causing bloody diarrhea are include *enteroinvasive E. coli*, *enterohemorrhagic E. coli*, *Campylobacter jejuni*, and non-typhoidal *Salmonella*. Global spread, particularly in developing countries, happens most frequently during the warm months, and both sexes are equally impacted.[17]

The purpose of this study was to identify the most prevalent causative agent of bloody diarrhea in children under the age of two years, to discover the essential variables that predispose children to bloody diarrhea, and to shed light on the major clinical characteristic of bloody diarrhea in Mosul Province.

2-PATIENTS AND METHODS

A case-control study. The case group includes one hundred-forty-two children with bloody diarrhea (three or more loose bowel motions with visible blood in stool) were studied in Al-Salam Teaching Hospital in Mosul from the 15th of March to the 31th of December 2024. After obtaining ethical approval from the ethical committee of Nineveh Health directorate and parents' consent.

All of the study participants were less than two years of age. Those who had received antibiotics during their present illness and those with surgical conditions were excluded from the study. The questionnaire form includes six parts. Part one for socio-demographic information such as patients' age, sex, residence and history of having domestic animals (dogs, sheep, chicken or cows) in the house. Part two for patients' chief complaint and its associated symptoms including; diarrhea (frequency, presence of blood and mucous), vomiting, fever, tenesmus (pain during defecation), rectal prolapse and convulsion. Part three covers patients' feeding ways: breast, bottle, mixed, and family meals. Part four discusses the types of water supplies: tap water or other sources (river, tanker, or wells), as well as the history of boiling drinking water. Part five describes the physical examination findings; all patients were extensively checked, with a focus on signs and degree of dehydration. The patients' temperatures were taken from the axilla (plus 0.5°C), and those with temperatures greater than 38.5°C were considered to have high-grade fever, while those with temperatures less than 38.5°C were considered to have low-grade fever. The patients' weights were measured and put on a growth chart. Furthermore, all patients had a comprehensive systemic examination. Part six covers laboratory investigations, which include stool cultures as well as peripheral WBC counts.

The control group includes one hundred children with acute watery non-bloody diarrhea from the same age group and took from the same hospital. Stool culture and peripheral WBC count not done in the control group. Comparison with the control group was limited to risk factors and clinical features. It is important to mention that in the analysis of clinical features of amebic bloody diarrhea the study takes 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.

The Chi-square (x) test was used to statistically examine the data and ascertain the relative significance of the different variables. P. values below 0.05 were regarded as statistically significant, while those below 0.01 were regarded as extremely significant.

3. RESULTS

Enteropathogens were detected in stool of 120 (84.5%) subjects and identified as follows; 79 (55.6%) subjects of them had *Entamoeba histolytica*. Moreover; 17 (12%) subjects had *E. coli*, 15 (10.6%) subjects had *shigella* and 9 (6.3%) subjects non-typhoidal *salmonella*. As shown in table 3.1.

Table 3.1: Isolation rate of enteropathogens in children with bloody diarrhea.

Enteropathogens Isolated	Number	Percent
Entamoeba Histolytica:	79	55.6%
-Cyst	44	31%
-Trophozoite	35	24.6%
E. coli	17	12%
Shigella	15	10.6%
Salmonella	9	6.3%
No isolate	22	15.5%
Total	142	100%

Table 3.2 shows comparison between patients with Bloody diarrhea (bacterial, amebic, unknown source of infection) and those with watery diarrhea regarding sociodemographic information. Statistically significant difference found between the two groups regarding weight for age (P value = 0.03), boiling of water (P value = 0.009), and history of animal contact (P value = 0.001).

Table 3.2: Comparison between the two groups regarding their socio-demographic information.

Variable	Bacterial, Number (%)	Amebic, Number (%)	Unknown, Number (%)	Total, Number (%)	Controls =100	P-value
Age (months):						
0-6	10 (24.31%)	23 (29.11%)	4 (18.18%)	37 (26.05%)	25	
7-12	19 (46.34%)	32 (40.51%)	11 (50%)	62 (43.66%)	35	0.54
13-18	4 (9.75%)	15 (18.98%)	4 (18.18%)	23 (16.19%)	25	
19-24	8 (19.51%)	9 (11.39%)	3 (13.63%)	20 (14.08%)	15	
Sex:						
Male	21 (51.21%)	55 (69.62%)	12 (54.55%)	88 (61.9%)	54	0.11
Female	20 (48.78%)	24 (30.37%)	10 (45.45%)	54 (38.1%)	46	
Weight for age:						
Less than 5th centile	13 (31.7%)	33 (41.77%)	10 (45.45%)	56 (39.4%)	26	**0.03**
More than 5th centile	28 (68.2%)	46 (58.22%)	12 (54.55%)	86 (60.64%)	74	
Residence:						
Urban	23 (56.09%)	47 (59.49%)	11 (50%)	81 (57%)	62	0.44
Rural	18 (43.90%)	32 (40.51%)	11 (50%)	61 (43%)	38	
Type of feeding:						
Breast	7 (17.07%)	15 (18.98%)	3 (13.36%)	25 (17.60%)	18	
Bottle	24 (58.30%)	39 (49.36%)	15 (68.18%)	78 (54.90%)	40	0.47
Mixed	7 (17.07%)	12 (15.18%)	2 (9.09%)	21 (14.78%)	28	
Family food	3 (7.31%)	13 (16.45%)	2 (9.09%)	18 (12.67%)	14	
Water supply:						
Tap water	32 (78.04%)	68 (86.07%)	17 (77.27%)	117 (82.40%)	85	0.59
Other sources*	9 (21.95%)	11 (21.95%)	5 (22.73%)	25 (17.60%)	15	
Boiling water:						
Yes	9 (21.95%)	10 (12.65%)	6 (27.27%)	25 (17.60%)	32	**0.009**
No	32 (78.05%)	69 (87.34%)	16 (72.73%)	117 (82.40%)	68	
Animal contact:						
Yes	25 (60.97%)	27 (34.17%)	6 (27.27%)	58 (40.80%)	20	**0.001**
No	16 (39.02%)	52 (65.82%)	16 (72.73%)	84 (59.20%)	80	

*River, irrigation canals, wells.

Table 3.3 shows comparison between patients with Bloody diarrhea (bacterial, amebic, unknown source of infection) and those with watery diarrhea regarding their clinical manifestations. Statistically significant difference between the two groups regarding frequency of bowel motion (P value = 0.02), dehydration (P value <0.001), presence of fever (P value <0.001), tenesmus (P value <0.001), vomiting (P value = 0.002), rectal prolapse (P value <0.001) and convulsion (P value <0.001).

Table 3.2: Comparison between the two groups regarding their clinical manifestation.

Variable	Bacterial, Number (%)	Amebic, Number (%)	Unknown, Number (%)	Total, Number (%)	Controls =100	P-value
Frequency of bowel motion:						
Less than 5	2 (4.87%)	19 (24.05%)	5 (22.72%)	26 (18.30%)	10	**0.02**
5-10	12 (29.26%)	42 (53.16%)	7 (31.81%)	61 (43%)	34	
More than 5	27 (65.85%)	18 (22.78%)	10 (45.45%)	55 (38.70%)	56	
Dehydration:						

Mild Moderate Severe	16 (39.02%) 20 (48.78%) 5 (12.20%)	54 (68.35%) 21 (26.5%) 4 (5.06%)	12 (54.55%) 8 (36.36%) 2 (9.09%)	82 (57.71%) 49 (34.50%) 11 (7.80%)	18 46 36	**<0.001**
Fever: Low grade (<38.5°) High grade (>38.5°)	 13 (31.7%) 26 (63.4%)	 36 (45.56%) 32 (40.5%)	 13 (59%) 6 (27.3%)	 62 (43.7%) 64 (45%)	 57 18	**<0.001**
Tenesmus	36 (87.8%)	55 (69.62%)	19 (86.4%)	110	36	**<0.001**
Vomiting	25 (61%)	24 (30.37%)	13 (59%)	62	78	**0.002**
Rectal prolapse	9 (22%)	5 (6.32%)	1 (4.5%)	15 (10.05%)	0	**<0.001**
Convulsion	10	1 (1.26%)	3 (13.6%)	14 (9.8%)	2	**<0.001**

Table 3.3 shows comparison between patients with bacterial, amebic and unknown cause of bloody diarrhea regarding their WBC counts. It's evident that a statistically significant difference was found between them regarding this issue (P value <0.001).

Table 3.3: Comparison between patients with bacterial, amebic and unknown cause of bloody diarrhea regarding their WBC counts.

Variable	Bacterial, Number (%)	Amebic, Number (%)	Unknown, Number (%)	Total, Number (%)	P-value
WBC count: More than 15000 Less than 15000	 10 (24.4%) 31 (75.6%)	 0 (0%) 79 (100%)	 3 (13.6%) 19 (86.54%)	 13 (9.2%) 129 (90.8%)	**<0.001**

4. DISCUSSION

The study revealed that Entamoeba histolytica was the most common isolated pathogen as it was detected in stool samples of more than half of the patients (55.6%). In contrast, shigella species which are known by many as the most common causative agent of bloody diarrhea, was detected only in 10.6% of patients. This finding was similar to that observed in a study conducted in Babylon.[15] The opposite finding was reported in a study conducted in Sulaimani.[18] The reason for this difference could be explained by the fact that invasive amebiasis and Shigellosis are occurred in frequent epidemics within different cities of the world.

The study found that the weights for age of patients with bloody diarrhea were significantly lower than those of watery diarrhea, which indicates their poor nutritional status, makes them susceptible to different virulent microorganism, this is in agreement with et al Barış Kuşkonmaz et al study findings[19] Moreover; patients with bloody diarrhea were used boiling water less than those with watery diarrhea. This is because boiling water effectively kills disease-causing organisms such as bacteria, viruses, and parasites, all of which are typical causes of watery diarrhea. Comparable findings were obtained from Dhia H. Al-Beldawi et al.[20] In the same way animal contact was found in this study to be significantly associated with bloody diarrhea due to exposure to certain pathogens, which is runs with Rahul Bawankule et al study's result.[21]

Patients with bloody diarrhea exhibited more frequent bowel movements, greater dehydration, higher fevers, tenesmus, rectal prolapse, and a higher likelihood of experiencing convulsions compared to those with watery diarrhea. Which is parallel to Dhia H. Al-Beldawi et al.[20] Additionally; the study found vomiting is significantly higher among patients with watery diarrhea than those with bloody diarrhea, as bloody diarrhea, in spite of been potentially more severe, but it is often associated with different underlying causes, some of which are less likely to cause vomiting. This is similar to Barış Kuşkonmaz et al study findings.[19]

On the other hand; patients with bacterial bloody diarrhea was shown in this study to be significantly having higher WBC counts than patients with amebic and unknown cause of bloody diarrhea, which is consistent to Amal Naous et al findings.[22]

5-CONCLUSION

In Iraq, the most common offending bacterium in children age less than 2 years with bloody diarrhea is *Entamoeba histolytica*. The presence of domestic animals in the home, poor nutritional condition, and non-boiling drinking water all increase the risk of bloody diarrhea in children. Bloody diarrhea was far more likely than watery diarrhea to cause vomiting, convulsions, tenesmus, high temperature, and more frequent bowel movements. The clinical diagnosis of bacillary dysentery may be supported by the fact that peripheral leukocytosis is more prevalent in bacterial bloody diarrhea than in amebic bloody diarrhea. Boiling water and promoting breastfeeding reduce the risk of enteropathogen transmission.

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Conflict of Intertest

About this study, the authors disclose no conflicts of interest.

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