



Etiology Causes of the Chronic Diarrheal Infection in Children Aged Under Five Years in Salah Al-Din Government

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ABSTRACT: Diarrhea is a factor contributing to both death and illness among children below the age of five in poor countries. Childhood mortality from diarrhea surpasses that of malaria, HIV/AIDS, and measles. The objective of this study was to evaluate the frequency of diarrhea and its related determinants among children aged below five years. The study included collecting 50 stools from children with chronic diarrhea and some other intestinal disorders who came to the hospitals of Salah al-Din Governorate / Dhuluiya District and some private laboratories, whose ages ranged from one month to five years during the period between the beginning of December 2023 and the end of June 2024. Males had a higher frequency of diarrheal infection than females, and age groups (1-12) months were more infected than others (p -value < 0.05). Increasing bacterial and fungal illness in weight group (7-11) and cold in this age. Diarrhea from food contamination and unhealthy food increases in 2-6) and 7-11-kg children. As well as cold-induced diarrhea (2-6Kg), $p>0.05$. This study concluded bacterial infection more common cause of diarrheal infection than other cause, and male more infected than female. In addition, increase incidence in age groups (months). Furthermore, mixed infection with gram positive and negative more common than only gram positive and negative alone.

Keywords: Chronic diarrhea, Childhood mortality, gram stain



1. INTRODUCTION

Diarrhea is a universal occurrence that everybody inevitably encounters at some juncture in their lives. Diarrheal disease in children under the age of 5 is a significant contributor to illness and death in developed countries, and particularly a major cause of illness in industrialized countries. The annual incidence of diarrheal diseases among children under the age of 5 in poor countries ranges from 3 to 9 (1, 2). The World Health Organization (WHO) has defined diarrhea as the occurrence of three or more instances of loose or liquid stools per day, or a higher frequency of bowel movements than what is considered normal for the individual. According to the Global Health Estimates of 2020 by the WHO, diarrhea is ranked as the second cause of childhood mortality, accounting for 8.6% of 5.9 million deaths among children under 5 years old globally and 88% of all deaths occurred in subSaharan Africa and South Asia (3, 4). Statistics from the National Hospital Discharge Survey reveal that around 170,000 of these children are admitted to hospitals annually, and this figure has remained constant throughout the 1980s and 1990s. Among these children, over 300 succumb

annually to complications linked to the diarrheal disease (5). The regular occurrence of well-formed stools or the passage of loose, semi-solid stools by breastfed infants should not be classified as diarrhea (6). Diarrhea can be caused by either noninfectious factors or by an infectious cause. Diarrhea is categorized into different types depending on the length of time the symptoms continue. These types include acute diarrhea (lasting less than 2 weeks), persistent diarrhea (lasting more than 2 weeks but less than 4 weeks), and chronic diarrhea (lasting more than 4 weeks). Diagnosing chronic diarrhea and parasite diseases poses significant problems (7). Parasitic infections that result in diarrhea are of particular significance in young children, individuals with weakened immune systems, and those residing in environments characterized by inadequate sanitation and hygiene, as well as dangerous food and water sources. Travelers from industrialized countries are a vulnerable demographic, especially prone to parasite pathogens due to their lack of established protective immunity from prior exposure. Some of these organisms have zoonotic origins, meaning they can be transmitted between animals and humans. This poses potential concerns for those who work with or engage in leisure activities involving these organisms (8). The objective of this study was to evaluate the frequency of diarrhea and its related determinants among children aged under five years.

2. MATERIALS AND METHODS

2.1 Subjects

The study included collecting 100 stool samples using clean, sealed plastic containers with a lid from children with chronic diarrhea and some other intestinal disorders who came to the hospitals of Salah al-Din Governorate / Dhuluiya District and some private laboratories, whose ages ranged from one month to 36 months during the period between the beginning of December 2023 and the end of June 2024. The personal information was recorded according to a form prepared for this purpose, which included gender, age, weight, date of visit, area of residence, infection with intestinal parasites, symptoms of the disease, blood tests and their results, and other notes.

2.2 Samples Examination

Macroscopic Examination Stool samples are examined in the laboratory by observing the consistency, color, odor, and the presence of mucus or blood in the samples. If there is more than one sample to be examined, the samples containing mucus or blood are examined, and then the rest of the samples are examined.

2.3 Microscopic examination

The sample was examined within 1 hour from collection to detect the microbe infection by microscope. The samples were first examined by (direct wet mount) method, (ether concentration techniques), Staining methods(Gram Stain) (9).

2.4 Statistical analysis

Analysis of the data was conducted using the SPSS version 20 statistical software tool. A statistical significance level was established as $p < 0.05$ (10).

3. RESULTS AND DISCUSSION

A total of 50 patients with diarrhea (30 male and 20 female). In male, about 14 (58.3) males with diarrhea infected with bacterial or fungal infection and 8(44.4) eating contaminated or unhealthy food, and 8(%) the cause of diarrhea is cold. In female 10(41.7) with bacterial or fungal infection and 10(55.6%) eating contaminated or unhealthy food. As shown in Table (1),

Table 1: Relation between sex and cause of diarrheal infection

According to sex	bacterial or fungal infection	%	Eating contaminated or unhealthy food	%	Colds	%	Total
Male	14	58.3	8	44.4	8	100	30
Female	10	41.7	10	55.6	0	0	20
Total	24	100	18	100	8	100	50
Chi-Square = 7.176 p-Value = 0.028							

This study showed that age and cause of diarrheal infection were related. In the age group between 1 and 12 years, bacterial and fungal infection increased diarrheal infection by 16(66.6), and eating contaminated or unhealthy food and cold increased it by 12 (66.7) and 8(100.0) at p-value 0.034. As shown in Table (2),

Table 2: Relation between age and cause of diarrheal infection

According to age	bacterial or fungal infection	%	Eating contaminated or unhealthy food	%	Colds	(%)	Total
12 – 1	16	66.6	12	66.7	8	100.0	36
24 – 13	4	16.7	2	11.1	0	0.0	6
36 - 25	4	16.7	4	22.2	0	0.0	8
Total	24	100.0	18	100.0	8	100.0	50
Chi-Square = 6.167 p-Value = 0.034							

This study showed the relation between weight and cause of diarrheal infection, in which increase bacterial and fungal infection in weight group between (7-11), also increased cold in this age. While diarrhea caused by food contamination and unhealthy food increase in age group (2-6) Kg and (7-11) Kg. Furthermore, diarrhea due to cold increase (2-6) Kg, at p-value >0.05. As shown in Table (3).

Table 3: Relation between weight and cause of diarrheal infection

According to weight	bacterial or fungal infection	%	Eating contaminated or unhealthy food	%	Colds	%	Total
2 – 6 Kg	6	27.3	8	40.0	6	75.0	20
7 – 11 Kg	12	54.5	8	40.0	2	25.0	22
12 Kg – 16	4	18.2	4	20.0	0	0.0	8
Total	22	100.0	20	100.0	8	100.0	50
Chi-Square = 6.171 p-Value = 0.05							

This study showed the relation between Residence and cause of diarrheal infection that showed no difference between patient that lives Urban and Rural, at p-value >0.05. As shown in Table (4)

Table 4. Relation between Residence and cause of diarrheal infection

According to Residence	bacterial or fungal infection	%	Eating contaminated or unhealthy food	%	Colds	%	Total
Urban	10	41.7	8	44.4	2	25.0	20
Rural	14	58.3	10	55.6	6	75.0	30
Total	24	100.0	18	100.0	8	100.0	50
Chi-Square = 0.926 P-Value = 0.629							

As shown in Table (5), there is statistical differences in the type of causative agent as bacterial or parasite at p-value <0.05. Bacterial or fungal cause, cold, and eating contaminated or unhealthy food cause increased in mixed infection with gram positive and gram negative that were 8 (36.3) and 8(80.0), and 6(33.3) respectively, at p-value <0.05.

Table 5. Relation between gram stain and cause of diarrheal infection

According to gram	bacterial or fungal infection	%	Eating contaminated or unhealthy food	%	Colds	%	Total
+VE	6	27.3	4	22.3	2	20.0	12
-VE	2	9.1	2	11.1	0	0.0	4
-VE & +VE	8	36.3	6	33.3	8	80.0	22
Not growth	6	27.3	6	33.3	0	0.0	12
Total	22	100	18	100.0	10	100.0	50
Chi-Square = 8.093 P-Value = 0.022							

This study showed increase incidence of diarrhea in male than female, this may be due to several factors, including the physiological difference between the sexes and the relative quality of nutrition, as well as males being more active than females. also males are more susceptible to infection due to playing outside the home and mixing with other children more. The reason for this may be that the number of males visiting hospitals is higher than females, and it may be related to certain social and environmental habits. In a study conducted by Thiam et al., it was reported that girls suffer from diarrhea more frequently than boys(11) . Conversely, boys in research conducted in Sudan had a higher incidence of diarrhea (12). Previous research indicated a higher prevalence of the disease among boys (36%) compared to girls (29%)(13) . These results suggest that boys have more diarrhea than girls.

The study revealed a striking correlation between diarrhea and children aged 1-12 months compared to children aged 24 months and more. This result was consistent with previous research (14). The highest incidence of diarrhea occurring between the ages of 6 and 11 months can be attributed to the introduction of contaminated weaning meals (15). Furthermore, at this age, crawling begins, and the potential of consuming contaminated substances may lead to the development of diarrhea. The incidence of diarrhea in children reduces after 12 months, perhaps due to the development of immunity to pathogens resulting from recurrent exposure (16). The impact of diarrhea on the nutritional condition of children is highly significant and to this day is regarded as the primary factor

contributing to child malnutrition. The Multiple Indicator Cluster Survey conducted by UNICEF in 1996 in Iraq revealed that diarrhea among children aged six months to 2 years exceeded 50%, while children aged 3 to 5 years old ranged from 10 to 20%. Hence, diarrhea declined as children grew older (17). Analysis of this study reveals that those aged 12-36 months had a higher likelihood of experiencing diarrhea than those who were either younger or older. These findings align with earlier studies conducted in different regions of sub-Saharan Africa (18). Various mechanisms, including maternal antibodies against enteric pathogens and ongoing breastfeeding, may protect against diarrhea in the youngest age range. After six months of age, introducing supplemental meals and changes in dietary patterns may lead to losing this protective mechanism. A possible explanation for the lower occurrence of diarrhea in the oldest age group is the development of acquired natural immunity (19).

The correlation between diarrhea and the nutritional condition of children was statistically significant ($p < 0.05$), indicating that children with diarrhea run a 4.5-fold higher risk of malnutrition (20). This study showed that bacterial and fungal infection increased in age between (7-11) Kg. While diarrhea caused by food contamination and unhealthy food increase in age group (2-6) Kg and (7-11) Kg. Furthermore, diarrhea due to cold increase (2-6) Kg. An investigation was undertaken by Karambizi *et al.* to document the fluctuations in the occurrence of diarrhea and the frequency of malnutrition among children in an urban Brazilian City between 1989 and 1996. Significant changes were seen over time in the burden of diarrhea and nutritional status of children in this community. Additionally, new evidence was presented indicating a strong correlation between malnutrition and a higher occurrence of diarrhea (21).

This study demonstrated no differences in incidence of diarrheal infection between Rural and Urban. This study disagree with Berhe *et al.*, (22), that showed increase incidence –Urban than Rural.

In Iraq, several studies have been undertaken to investigate the occurrence of intestinal parasites. One such study (23), reveals that the prevalence of intestinal parasites among children in Ninevah Governorate was 64.16%. This finding suggests that the predominant intestinal parasite among the children was *Entamoeba histolytica*, accounting, followed by *Giardia lamblia* and *Enterobius vermicularis*, respectively. Despite the implementation of surveillance and control programs in high-income countries, bacterial gastrointestinal infections persist in causing illness and death, as well as contributing to economic loss in most regions of the world. Although acute bacterial intestine infection symptoms are often mild to moderate and spontaneously resolve, the sickness can sometimes lead to a rapid deterioration of a patient's state (24). Common organisms responsible for gastroenteritis are *Salmonella* and *Shigella*, *Campylobacter jejuni*, *Escherichia coli*, *Clostridium*

difficile, and *Vibrio cholerae*(25). In general, phagocytosis is a non-specific host defensive mechanism against most infections. The phagocytic activity of leukocytes, particularly polymorphonuclear cells (PMNs), is induced by the inflammatory mediators released during bacterial infection.

4. CONCLUSION

This study reached the conclusion that bacterial infection is the most prevalent cause of diarrheal infection compared to other causes, and males are more affected than females. Moreover, the occurrence of mixed infection with both gram positive and negative bacteria is more prevalent than infection with either gram positive or negative bacteria alone.

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