

Research Article

## Factors Association with some Bacteria Cause Diarrhea Disease among Children Under 5 Years Old

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### Abstract

Diarrhea has been a common cause of morbidity and mortality in children under 5 years old. This study was intended to assessment level of personal hygiene, type of water taken by children, crowding index and some factors associated with some bacterial infection in children under 5 years."

This study enrolled 143 children under 5 years with clinical evidence of diarrheal disease through the period extending from 15/4/2016 to 30/8/2016, who were admitted to Baghdad teaching hospital, stool samples were collected from children who had diarrhea were inoculated on selective culture media using standard method. "The isolate were identified depending on morphological feature of colonies and from all media biochemically using API 20E system."

A total bacterial infection was observed (13.9%). Specific prevalence of species bacteria is as follows,"*E.coli* (7.7%), and *Shigella spp.* (2%), and *Salmonella spp.*(3.5%) and *V. cholera* (0.7%)." Finding from our study indicate that patient in the age group >5 years of age were more likely to have diarrhea than those who were younger, and Children that consumed tap water were more infected with bacteria (9.7%). In this study, crowding index were associated with diarrheal disease, "children from households with 1 or 2 people per room were (1.4%) less likely to have diarrhea compared to children from household with more than 3 people per room (30%). Our results indicate that availability of house hold sanitation facilities, access to filter and clean water, good personal hygiene and better nutrition were all associated with lower incidence of diarrhea."

**Keywords:** Diarrhea, *E.coli*, *Shigella sp*, *Salmonella spp.*

### الخلاصة

يعد الإسهال من الأسباب الشائعة لمعدلات الاعتلال والوفيات بين الأطفال دون سن الخامسة من العمر. تهدف الدراسة الى تقييم "المستوى الصحي للفرد، مصادر مياه الشرب المستخدم من قبل الأطفال ومؤشر عامل الزحام وبعض العوامل المرتبطة مع الإصابات البكتيرية لدى الأطفال دون سن الخامسة من العمر".

شملت الدراسة 143 طفل دون سن الخامسة من العمر يعانون من مرض الاسهال في مستشفى بغداد التعليمي والمشخص من قبل اطباء اختصاص بالاعتماد على الاعراض والعلامات السريرية. خلال الفترة من 2016/4/15 إلى 2016/8/30. تم جمع عينات البراز من هؤلاء المرضى حيث تم زرع عينات البراز على اوساط زرعه انتقائية لغرض عزل وتشخيص البكتريا، في حين استخدم نظام API 20E للتشخيص النهائي للبكتريا المعزولة.

وجدت الدراسة ان (13.9%) من العينات كانت مصابه بأنواع مختلفة من البكتريا المسببة للإسهال وهي على النحو التالي، القولونية (7.7%)، الشيجلا (2%)، السالمونيلا (3.5%)، وضمات الكوليرا (>1%). اشارت الدراسة ان الاطفال ضمن الفئة العمرية > 5 سنوات اكثر عرضه للإصابة بمرض الاسهال مقارنة مع الفئات العمرية الأخرى ضمن مجتمع البحث، كما وجدت الدراسة ان الاطفال الذين يستخدمون مياه الصنبور كمصدر لمياه الشرب، هم اكثر عرضه للإصابة بالبكتريا المسببة للإسهال وبنسبة (9.6%)، كما ارتبط مؤشر عامل الزحام مع الإصابة بمرض الاسهال، حيث وجدت الدراسة ان الاطفال ضمن الاسر التي تمنح غرفة معيشه واحده لكل شخص او اثنين من افرادها اقل عرضه للإصابة مقارنة مع تلك الاسر التي تمنح لكل ثلاثة اشخاص او اكثر من افرادها غرفة معيشه واحده. تشير نتائج البحث الى ان توافر المرفق الصحية النظيفة، ووصول المياه المفلتره والمعقمة، والنظافة الشخصية والتغذية الجيدة، ترتبط جميعها بالمساهمة في خفض مستوى الإصابة البكتيرية لمرض الاسهال.

## Introduction

Diarrhea is defined as the passage of three or more loose or liquid stools per day or more frequent than normal for the individual [1]. Variety of bacteria, viruses and parasites are the cause of diarrhea. Infection spreads through contaminated food or drinking water or from person to person as a result of poor hygiene. Diarrhea is both preventable and treatable disease. Fluid loss in diarrhea has fatal outcomes and it is the leading cause of malnutrition [2] [3] Diarrhea is the second leading cause of child morbidity and mortality, especially in the developing countries.

It is estimated that there are 2.5 billion episodes and 1.5 million deaths annually in children under-five years of age. This accounts for 21% of all the deaths in developing countries and the number has remained unacceptably high [4]. Diarrhea kills young children more than Acquired Immunodeficiency Syndrome (AIDS), malaria and measles combined. It also exposes children to secondary infection. Diarrhea is a major public health problem in Iraq as evident from its increasing incidence and fatality [5]. Unlike other diseases, diarrhea is generally not considered as an illness and, thus most diarrhea cases are either not managed at all or managed at home through traditional approaches [6]. About one half of children under five years are not taken to any healthcare center and about one-third of the children with diarrhea do not receive any treatment at all [7].

Diarrhea is not lethal itself, the improper knowledge of mother and their misdirected approach towards its management leads to high degree of mismanagement and resultant severe dehydration [8]. Although diarrhea kills about four million people in developing countries each year, it remains a problem in developed countries as well. In the United States, each child will have had 7-15 episodes of diarrhea by the age of 5 years, 9% of all hospitalizations of children less than 5 years old are associated with diarrhea, and 300-500 children die each year from this potentially preventable condition [9]. Twenty-four years ago, oral rehydration Organization's efforts to decrease diarrhea

morbidity and mortality, and Diarrheal Disease Control Programs have been established in more than 100 countries worldwide [9]. Appropriate healthcare-seeking behavior could prevent a significant number of child deaths and complications due to ill health [10].

Improving mothers' care-seeking behavior could also contribute in reducing a large number of child morbidity and mortality in developing countries. Between 1990 and 2000, diarrhea-related deaths decline by half thereby achieving World Summit Goal. While the cause-specific mortality is difficult to measure, it is estimated that more than one million child deaths per year have been prevented among the causative agents, the following bacteria have been reported: enterotoxigenic *Escherichia coli* (ETEC), *Shigella*, *Salmonella*, and *Campylobacter*" [11].

"Among the viruses, *rotavirus* seems to be the most common [12]. In developing countries, diarrheal infections under 5 years child are generally associated with *rotavirus* often at the time of weaning [13]. The infectious agents associated with diarrheal disease are transmitted chiefly through the faecal-oral route [14]. Food contamination is one major route for the transmission of enter pathogen, especially under the hygienic conditions prevailing in a rural setting. Various studies have reported that the source of enter pathogen was either water or food [15]. For most people in developing countries, the major source of food is cereals, and dairy products are limited to a very small segment of affluent groups. Presumably, the reports of food as the origin of diarrhea refer to cereal-based diets, since all the cases cited came from developing countries" [15].

## Materials and Methodology

### *Study population:*

During the peak diarrheal season from the period 15/4/2016 to 30/8/2016, stool samples were collected from 143 children under 5 years of age who were admitted with diarrheal diseases to Baghdad Teaching hospital with clinical evidence of diarrheal disease diagnosed by physicians. Questionnaire for each patient

containing the following information:

“Age, family size, number of room occupied the house, education and knowledge mothers about some practices regarding diarrheal diseases, source of drinking water consumed by patients.”

**Stool Samples:**

“Fresh stool sample were collected from 143 diarrheal patients and transferred to the microbiology laboratory on ice pack, processed within 4 hours of collection for culturing according to standard method [16].

All specimens were inoculated on maconkey agar, *Salmonella-Shigella* agar, and Thiosulfate-Citrate bile Salts Sucrose medium.” Colonies of *V. cholera* were streaked on gelatin agar incubated at 37c to determine the production of gelatinase and then inoculated into kligler iron agar and motility indol urea agar media. After overnight incubation at 37c the “MacConkey agar and *Salmonella-Shigella* agar” plates were checked for non-lactose fermentation colonies.

Suspected enteric pathogens from all media were identified biochemically using standard bacteriological method and the ApI 20E system “bio Meriux, Marcy; Etoil, France. In addition lactose fermenting and any non-lactose fermenting colonies typical of *E.coli* were selected from MacConkey agar plate and identify.”

The study was enrolled 143 children under 5 years old who were admitted to Baghdad teaching hospital, through the period extending from 15/4/2016 to 30/8/2016, with clinical evidence of diarrheal disease diagnosed by a physician. From the total 143 stool samples found 20 bacterial cell isolate as shown in table 1 in percentage 13.9%, while the “*E.coli* had more frequent 7.7% followed by *Salmonella spp.*” 3.5% in this study the positive rate of bacterial isolate tended increase with age group (1-2), (3-4) years as shown in Table 1, and reach peak level in age group (<5) years. It can be seen from Table 2 that the high infection seen in children living with crowded family 7.7%. As well as in this study the percent of

bacterial cell isolates from patients consumed tap water as source of drink water tend increase 9.8% in compression with patients consumed filtered water 4.1%. As shown in Table 3. From the Table 4, it has been shown that most of mothers wash their hands after coming from latrine 71.3%, It has been also shown that few mothers 28.7% are not wash hands after coming latrine., while the most mother are not wash their hands after changing baby’s diapers, washing breast before breast feeding and washing hands before cooking. Their percentage were 78.3%, 55.3%, and 72.2% respectively.

Table 1: Distribution of children according to the age group and percentage of bacterial isolate.

Age group	No. children (%)	“ <i>Shigella</i> ” spp. (%)	“ <i>Salmonella</i> ” spp. (%)	“ <i>V. cholera</i> ” (%)	<i>E.coli</i> (%)	Total (%)
>1	13 (9.2)	0	0	0	1 (0.7)	1 (0.7)
1-2	25 (17.3)	1 (0.7)	1 (0.7)	0	3 (2.1)	5 (3.5)
2-3	34 (23.7)	0	1 (0.7)	0	1 (0.7)	2 (1.4)
3-4	39 (27.4)	1 (0.7)	1 (0.7)	0	3 (2.1)	5 (3.5)
>5	32 (22.4)	1 (0.7)	2 (1.4)	1 (0.7)	3 (2.1)	7 (4.8)
Total %	143 (100)	3(2)	5 (3.5)	1 (0.7)	11 (7.7)	20 (13.9)

Table 2: Distribution of children according to the crowding index.

Crowding index	No. children %	No. bacteria isolate %
1- 1.9	34(23.7)	0
2- 2.9	25(17.6)	2(1.4)
3- 3.9	43(30.1)	7(4.9)
4+	41(28.7)	11(7.7)
Total (%)	143(100)	20(13.9)



Table 3: "Distribution of participant's parent according to consume the source of drinking water".

Source of drinking water	No. of parent %	No. bacteria isolate %
Filtered water	69(48.3)	6(4.1)
Tap water	74(51.7)	14 (9.8)
Total (%)	143(100)	20(13.9)

Table 4: "Respondent mothers about practices regarding diarrheal disease".

Personal hygiene	Yes %	bacteria isolate%	No%	bacteria isolate%
"Washing hand before cooking"	37 (25.8)	0	106 (74.2)	3 (2.1)
"Use soap after coming from latrine"	102 (71.3)	2 (1.3)	41 (28.7)	4 (2.7)
"Washing breast before breast feeding"	26 (18.2)	0	117 (81.8)	2 (1.3)
"Washing hand after handling raw meat / poultry"	64 (44.7)	1 (0.8)	79 (55.3)	3 (2.1)
"Washing hand after changing baby's diapers"	31 (21.7)	0	112 (78.3)	5 (3.6)

"Diarrheal disease is a major public health problem for children in developing countries. This study, which covered the diarrheal seasons in 2016 year to determine the bacterial infection and some factors associated with diarrheal disease in hospitalized children under 5 years of age." We detected enter pathogens in (13.9) % of patients with diarrhea. "*E.coli* strain was the first most common group enteropathogen isolates (7.7) %. The relative prevalence of these categories diarrhea *E.coli* was similar to that observed among malnourished children [17]) and children with acute diarrhea in north Jordan [18]," and their presence in children with diarrhea in other developing countries has been documented [19] [20]. However, the findings of this study confirm the importance of "*salmonella spp.* as major causes of diarrhea. We found *salmonella*

*spp.* nearly (3.5) % of the patients studied, *salmonella* are one of the most important etiological agents of diarrhea infection in the world. Other study found that multi-antibiotic resistance in *salmonella spp.*, has been associated with enhance virulence and excess mortality in patients compared with infection with sensitive strains [21] [22]." "Also found that *shigellosis* was 2% in children under 5 years. Other study found incidence of *shigellosis* in all ages was 3.7% and 3.2% respectively [23] [24]." But other study reported 9-12.6% [25] [26]. "*Shigella spp.*, are highly fastidious organisms that die rapidly in an unsuitable environment, including the unavoidable temperature fluctuation encountered during transport in contrast to many other enteric infection, shigellosis is clearly not confined to childhood. One the contrary the incidence of shigellosis not only increased steadily after age 40 years, but the bacterial load of shigellosis patients increased after age 40 years suggesting that older people as well as very young children shed the highest bacterial load and many contribute disproportionately to the responsible for a large proportion of the diarrhea burden than was previously inferred from culture results or clinical diagnosis. The source of drinking water is very important for human health. In Iraq, most of the families use tap water to drink. In this study, (51.7) % of the respondents families used it as compared to (48.3) % use sterilized filtered water as source of drinking water." According to the United Nations report in 2007, shortage of safe drinking water in Iraq can lead to increased cases of diarrhea [27] [28]. Findings from our study indicate that patient >5 years of age were more likely to have diarrhea than those who were younger. This is similar to previous reports from other study [29] [30]. "Protection against diarrhea in the youngest age group may be conferred by several mechanisms such as maternal antibodies against enteric pathogens and current breast feeding. It is possible that after the age of >1 years, with the introduction of supplementary foods and changing nutritional habits, this protection is lost, and a high prevalence of persistent diarrhea among the

young infants in our study may be related to the early exposure to heavy microorganisms and immaturity of the gut immune system at early infancy. In this study, overcrowding were associated with a history of diarrhea, other study have reported similar findings" [31]. Children from households with 1 or 2 people per room were less likely to have diarrhea compared to children from households with more than 3 people per room. This may due to the fact that overcrowding living families tend to be poorer than wealth index, which impact the level of hygiene.

"The hands are central to many of our daily activities and the use of contaminated hands for cooking and eating enhances transmission of contaminants germs into the body through food, thereby causing ill-health. Mother serve the dual role of the children's nurse handling their faces, blowing their nostrils as well as the household chef prepares family's meals, feeds children. This coupled with poor knowledge and practice of simple hygiene increase the risk of spread of disease to the under five children. The study respondent demonstrated good hygiene of hand washing after coming latrine, handling raw meat/ poultry, this study supports several other studies" [32]. The generally high prevalence of disease of them did not "changing baby's diapers, washing hand before cooking and they did not washing breast before breast feeding". This result came in agreed with another study [33].

## Conclusions

The important of personal hygiene and hand washing which include the reduction of the occurrence of diarrheal disease and decontamination of the hand in order to prevent cross- transmission of infection, and may have implication for control of feco-orally transmitted communicable disease.

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