Prevalence of bacterial Infections in Children with Gastroenteritis at Ain Shams University Paediatrics Hospital

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Abstract: Background: Bacterial diarrheal disease is among the most common causes of mortality and morbidity in children 0–59 months most cases are treated empirically without the knowledge of etiological agents or antimicrobial susceptibility patterns. **Objectives:** Determine the prevalence of bacterial infection among gastroenteritis patients. **Subjects and Methods:** A cross sectional study sectional included 100 patients with gastroenteritis presented in pediatric hospital (Ain Shams University). Patients with immunodeficiency, chronic GIT illness, other concomitant diseases, were excluded **Results:** The results of stool culture revealed that the overall prevalence of bacterial infection among the patients was 79%, where: 3 (3.1%) had *shigella gastroenteritis,* 9 (9.2%) had *salmonella gastroenteritis*, 67 (68.4%) had E. coli *gastroenteritis*, while 19(19.4%) had no growth. **Conclusion:** bacterial infections among gastroenteritis children are underestimated, this study showed that frequency of bacterial infections among 100 cases of gastroenteritis among children was 79%.
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Key words: pediatric, gastroenteritis, bacterial infection, prevalence.

1. Introduction

Acute gastroenteritis is one of the most common infectious diseases and a significant cause of morbidity after upper respiratory tract infections. It accounts for a large proportion (18%) of childhood deaths, with an estimated 1.5 million deaths per year, making it the second most common cause of child deaths worldwide. The World Health Organization (WHO) and The United Nations Children's Fund (UNICEF) estimate that almost 2.5 billion episodes of diarrhea occur annually in children younger than five years in developing countries, with more than 80% of these cases occurring in Africa and South Asia (46% and 38%, respectively) **(1).**

The major pathogens causing acute infectious diarrhoea are viruses, bacteria, and parasites. Most cases are self-limited and resolve within 24–48h, and in developed nations, the aetiology is likely to be viral **(2).**

Bacteria affecting the small intestine are usually non-invasive organisms. Infected patients present with high-volume watery stools and in some cases mal absorption, frequently leading to dehydration. Patients often have peri umbilical pain and cramping. The most common bacteria in this category are enter toxigenic E. coli, Vibrio cholera, toxin-producing Staphylococcus aureus. These enteropathogens typically cause disease via enterotoxin production, ingestion of preformed toxin, and/or bacterial adherence to epithelial cells, Colonic and distal small intestinal pathogens are more likely to be invasive. They result in a syndrome of lower abdominal pain; small volume, frequent stools which can be bloody and tenesmus (when the rectum is involved) The most common pathogens causing this presentation are bacteria including Campylobacter, Shigella, Salmonella and Shigatoxin-producing E. coli, and Clostridium difficil. **(3).**

As new antimicrobial resistance patterns are continually emerging, it is important to check frequently updated sources for antimicrobial recommendations, the American College of Gastroenterology recommends a routine stool culture for a patient who presents with any of the following symptoms: severe or persistent diarrhoea, temperature of 38.5°C, bloody diarrhoea, or the presence of stool leukocytes, lactoferrin, or occult blood **(4).**

2. Subjects and Methods

Subjects:

Cross sectional study included children presented to pediatric hospital (Ain Shams University) with acute gastroenteritis. This study was conducted on 100 patients. patients with immunodeficiency, chronic GIT illness, other concomitant diseases, were excluded.

Methods:

All patients were subjected to through medical history and examination including: Sociodemographic data: (Age/Birth date, Sex, Order of birth, Residence, Family size, Consanguinity), History of diarrhea

(onset, course, duration, consistency, frequency, nature and amount), vomiting, abdominal pain, fever, extra GIT manifestations. History of drug intake, Family history of chronic GI illness, Examination at presentation: Anthropometric measurements: Weight and height were measured and plotted against CDC charts (weight for age & height for age) were calculated. Abdominal examination. Files of the patients were reviewed for ABG if available**.** 100 stool samples were collected from the cases, each sample was examined by microscope for protozoal detection, by Wet mount, formol ether and Modified zehiel neelsen stain.

3. Results

Table (1): Demographic and environmental data of the cases.

		No. = 100
Age (months)	Mean ± SD Range	26.62 ± 14.22 7 – 60
Sex	Female Male	44 (44.0%) 56 (56.0%)
Consanguinity	Negative Positive	67 (67.0%) 33 (33.0%)
Residence	Cairo Qalubia Giza Helwan Others	54 (54.0%) 14 (14.0%) 17 (17.0%) 4 (4.0%) 11 (11.0%)
Order Of Birth	1st 2nd 3rd 4th 5th 6th	10 (10.0%) 24 (24.0%) 33 (33.0%) 25 (25.0%) 7 (7.0%) 1 (1.0%)
Family Size	Mean ± SD Range	5.18 ± 1.14 3 – 8
Duration Of Diarrhea (days)	Mean ± SD Range	4.68 ± 1.21 2 – 7
Frequency Per Day (time)	Mean ± SD Range	6.78 ± 1.88 3 – 11

This table showed that the age of Patients ranged between 7 months to 60 month old with a mean of 26.62 months, 44.0% of them were females, 56.0% of them were boys**,** while percentage of consanguity among parents of cases was 67%.

Majority of cases were from greater Cairo (54.0%)**.**

Prevalence of bacterial infection

Out of the 100 stool samples examined, 3 species of intestinal bacteria were identified with an overall prevalence of 80.7%. The predominant bacteria were Ecoli v (68.4%) followed by salmonella, (9.2%), then shigella dysentery 3.1%, while 19.4% showed no growth **(Figure 1).**

Table 3: showed that sociodemographic data was not statistically different between groups however, the frequency of diarrhea was higher among those infected with organisms that showed no growth in the culture than other groups with bacterial infection.

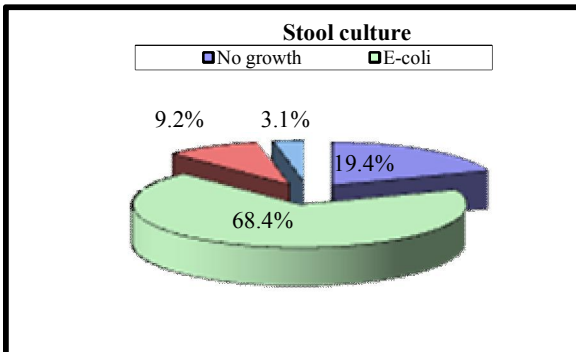

Figure 1

Table (3): Comparison between cases infected with different bacterial pathogens and those of negative bacterial culture results as regards to Socio-demographic and characteristics of diarrhea.

		No growth	E-coli	Salmonella Para	Shigella dysentery	Test value	P-value	Sig.
		No. = 19	No. = 67	No. = 9	No. = 3			
Age	Mean ± SD Range	21.26 ± 11.24 8 – 40	28.48 ± 15.33 7 – 60	21.78 ± 9.09 12 – 36	23.33 ± 6.11 18 – 30	1.710	0.170	NS
Consanguinity	Negative Positive	15 (78.9%) 4 (21.1%)	40 (59.7%) 27 (40.3%)	8 (88.9%) 1 (11.1%)	2 (66.7%) 1 (33.3%)	4.723	0.193	NS
Residence	Cairo Qalubia Giza Helwan Others	10 (52.6%) 3 (15.8%) 2 (10.5%) 0 (0.0%) 4 (21.1%)	38 (56.7%) 10 (14.9%) 12 (17.9%) 4 (6.0%) 3 (4.5%)	4 (44.4%) 0 (0.0%) 3 (33.3%) 0 (0.0%) 2 (22.2%)	2 (66.7%) 1 (33.3%) 0 (0.0%) 0 (0.0%) 0 (0.0%)	13.099	0.362	NS
Sex	Female Male	9 (47.4%) 10 (52.6%)	26 (38.8%) 41 (61.2%)	5 (55.6%) 4 (44.4%)	3 (100 %) 0 (0.0%)	5.129	0.163	NS
Order Of Birth	1st 2nd 3rd 4th 5th 6th	1 (5.3%) 7 (36.8%) 5 (26.3%) 4 (21.1%) 2 (10.5%) 0 (0.0%)	8 (11.9%) 15 (22.4%) 23 (34.3%) 17 (25.4%) 3 (4.5%) 1 (1.5%)	0 (0.0%) 1 (11.1%) 4 (44.4%) 3 (33.3%) 1 (11.1%) 0 (0.0%)	0 (0.0%) 1 (33.3%) 0 (0.0%) 1 (33.3%) 1 (33.3%) 0 (0.0%)	10.636	0.778	NS
Family Size	Mean ± SD Range	5.37 ± 1.21 3 – 8	5.09 ± 1.12 3 – 8	5.33 ± 1.00 4 – 7	6.00 ± 1.00 5 – 7	0.897	0.446	NS
Frequencyof diarrhea Per Day (time)	Mean ± SD Range	7.74 ± 1.69 5 – 10	6.82 ± 1.84 4 – 11	5.56 ± 1.42 3 – 7	5.33 ± 1.53 4 – 7	3.907	0.011	S
Nature	Fluidy Semiformed	18 (94.7%) 1 (5.3%)	48 (71.6%) 19 (28.4%)	5 (55.6%) 4 (44.4%)	0 (0.0%) 3 (100.0%)	13.926	0.003	HS
Amount	Moderate Large Average	1 (5.3%) 15 (78.9%) 3 (15.8%)	1 (1.5%) 39 (58.2%) 27 (40.3%)	0 (0.0%) 5 (55.6%) 4 (44.4%)	0 (0.0%) 2 (66.7%) 1 (33.3%)	5.114	0.529	NS
Consistency	Watery Mucoid Mucoid & bloody	18 (94.7%) 1 (5.3%) 0 (0.0%)	49 (73.1%) 18 (26.9%) 0 (0.0%)	5 (55.6%) 4 (44.4%) 0 (0.0%)	0 (0.0%) 1 (33.3%) 2 (66.7%)	71.683	0.000	HS
Duration Of Diarrhea (days)	Mean ± SD Range	4.37 ± 1.42 2 – 7	4.73 ± 1.19 3 – 7	4.56 ± 0.88 3 – 6	4.67 ± 0.58 4 – 5	0.465	0.707	NS
Duration of vomiting (days)	Mean ± SD Range	3.94 ± 1.34 2 – 6	4.45 ± 1.43 2 – 8	4.67 ± 1.22 3 – 7	5.67 ± 1.53 4 – 7	1.555	0.209	NS
Frequency of vomiting Per Day (times)	Mean ± SD Range	6.89 ± 1.41 5 – 9	6.36 ± 1.62 3 – 10	5.78 ± 0.97 4 – 7	5.00 ± 1.73 4 – 7	1.973	0.123	NS

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)*: Chi-square test; •: One Way ANOVA test-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)*: Chi-square test; •: One Way ANOVA test

4. Discussion

Acute gastroenteritis in children continues to be a significant health problem throughout the world. Millions of cases of acute diarrheal disease are estimated to occur annually just in 0–5 year old children.

Analysis of the collected data in this study revealed that, the overall prevalence rate of bacterial infections among 100 children presented with gastroenteritis was 79%, 3 species of intestinal bacteria were identified. The predominant bacteria were Ecoli (68.4%) followed *salmonella* (9.2%),19.4% had no growth, In ***Chiyangi et al. (5)*** a study done in Zambia Of the 271 stool samples analysed Vibrio cholerae 01 subtype and Ogawa serotype was the most commonly detected pathogen (40.8%), followed by Salmonella species (25.5%), diarrhoeagenic Escherichia coli (18%), Shigella species (14.4%) and Campylobacter species (3.5%).

While ***Abu-Elamreenin Egypt, etal*** studied bacterial Enteropathogens using a combination of traditional and molecular diagnostic techniques, bacterial enteropathogens were detected in 26 (17%) cases. Shigella spp. were found in 9 (6%) by PCR, and in 6 (4%) by bacteriological culture 3 S. flexneri, 2 S. sonnei, and 1 S. boydii). Salmonella spp. were found in 3 (2%) by both PCR and bacteriological culture. E. coli O157: H7 was found in 7 (5%) by PCR, and in 6 (4%) by bacteriological culture. Campylobacter was only identified by PCR.

in studies done in **Saudi Arabia**, Salmonella was found in 3% of patients, while Shigella was isolated in 2.6% in 1-5 years of age.

In our study most of cases was between 7 month to 60 month, (44%) of cases were females and 56% of cases males.

in Children from Salvador males corresponded to 55.4% of their sample, and most of their patients (42.7%) were between one and four years of age. Shigella was the commonest pathogen, being found in 141 (54.3%) cultures, while Salmonella was found in 100 (38.4%) cultures and Enteropathogenic E. coli in 19 (7.3%).

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