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EVALUATING THE CLINICAL-ETIOLOGICAL PROFILE OF HOSPITAL-ACQUIRED DIARRHOEA IN PATIENTS UNDER THE AGE OF FIFTEEN: A CLINICAL EXAMINATION

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ABSTRACT

Background: Approximately 2-32% of children treated to hospitals get hospital-acquired diarrhoea (HAD), which raises hospital stays, costs, and death. Every HAD episode causes the youngsters to lose nutrients that are essential for their growth. Paediatric patients are more vulnerable in hospitals because of their contact with patients who have communicable diseases, medical personnel, and contaminated surfaces. Poor infection control raises the risk even further in low-income institutions.

Aim: The purpose of the current clinical investigation was to evaluate the incidence and cause of paediatric patients' hospital-acquired diarrhoea.

Methods: The 120 participants in this research were hospitalised for causes other than diarrhoea and ranged in age from 1 to 15 years. Their hospital stays lasted longer than three days. Stool samples were taken from each research participant and analysed to see whether any bacterial, viral, parasite, or fungal agents were present. The human rotavirus antigen was found using a latex agglutination test, while *Clostridium difficile* was found using an ELISA assay.

Results: Of the 108 patients who had diarrhoea that they had acquired in the hospital, the majority (19.16%; n = 23) had Enteropathogenic *Escherichia coli*, followed by rotavirus (14.16%; n = 17), *C. difficile* (11.66%; n = 14), *E. histolytica* (10%; n = 12), and *Pseudomonas aeruginosa* (6.66%; n = 8). *Shigella flexneri* was detected in 5% (n=6) of the research patients, whereas the least amount of cases (n=3) of *C. albicans*, *Giardia lamblia*, *Cryptosporidium parvum*, *Proteus mirabilis*, and *Salmonella enteritidis* were seen.

Conclusions: According to the current study, paediatric patients experience hospital-acquired diarrhoea at a high rate, and the infectious aetiology was more common in these individuals than the non-infectious aetiology. The most frequent cause was an infection with germs.

Keywords: Bacterial infections, Children, *Escherichia coli*, Enteropathogenic, Hospital-acquired diarrhea.

INTRODUCTION

Approximately 2-32% of children admitted to hospitals get HAD (hospital-acquired diarrhoea), which raises hospital stays, costs, and death. Every HAD episode causes the youngsters to lose nutrients that are essential for their growth. Paediatric patients are more vulnerable in hospitals because of their contact with patients who have communicable diseases, medical personnel, and contaminated surfaces. Poor infection control raises the risk even further in low-income institutions. According to WHO data, out of 1.7 billion subjects with HAD, approximately 5.25 lakh paediatric subjects under the age of five die each year from hospital-acquired diarrhea.¹

Diarrhoea is three times more common in subjects under the age of three than it is in older subjects each year worldwide. The youngster loses several nutrients necessary for growth and development during each bout of diarrhoea. Long-term use of broad-spectrum antibiotics disrupts normal intestinal flora, allowing *Clostridium difficile* to colonise and raising the risk of hospital-acquired diarrhoea. Individuals admitted to low-income hospitals are at significantly increased risk because of interaction with healthcare personnel, contaminated surfaces, and sick individuals as a result of their own inadequate infection control practices.²

Previous research from both developed and developing nations indicates that the following are risk factors for hospital-acquired diarrhoea: age, nutritional status, immunological system, nasogastric intubation, endoscopies such as gastrointestinal procedures, and host-related factors. The primary cause for worry in hospitals and nursing homes about the management and spread of hospital-acquired diarrhoea is food contamination.³

The main cause of hospital acquired diarrhoea in the paediatric patients is improper handling, preparation, and storage of food by inexperienced hospital staff. Furthermore, hospitals typically have dangerous drinking water because of poor quality and inadequate storage, which exacerbates the issue and promotes waterborne infections and hospital-acquired diarrhoea.⁴

The goal of the current clinical investigation was to determine the frequency and cause of paediatric patients' hospital-acquired diarrhoea.

MATERIALS AND METHODS

The goal of the current cross-sectional clinical investigation was to determine the frequency and cause of paediatric patients' hospital-acquired diarrhoea. The study was carried out at Department of paediatrics, Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, West Bengal with approval from the relevant ethical committee. The individuals admitted to the Institute's Paediatrics Department made up the study population.

The study included a total of 120 subjects admitted to the Department of Pediatrics the mean age of 6.82 ± 3.46 years and the age range of 1 year to 15 years. Subjects between the ages of 1 and 15 who had been hospitalised to the Institute's Department of Paediatrics for causes other than diarrhoea, those who had been admitted for more than three years, and those who had given their agreement to participate were the study's inclusion criteria. The Centres for Disease Control and Prevention (CDC) definition⁵—which states that a hospitalised person must have acute diarrhoea onset with a minimum of three days of hospitalisation prior to diarrhoea onset—was applied to diagnosis research participants with hospital-acquired diarrhoea. Following each research subject's final inclusion, a thorough medical history was taken and a general checkup was conducted. The inspection of each research subject's faeces came next.

A series of laboratory experiments came next. Stool samples from each patient were gathered in sterile, disposable, and clean containers before being sent to the lab for analysis and processing. A range of laboratory tests were carried out to evaluate the identification of viruses, fungi, parasites, and bacteria. The rotavirus antigen was found using the latex agglutination test, and the toxins of *Clostridium difficile* were assessed using the enzyme-linked immunosorbent assay (ELISA).

Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were presented as a mean, standard deviation, percentage, and number. At $p < 0.05$, the significance threshold was maintained.

RESULTS

The goal of the current cross-sectional clinical investigation was to determine the frequency and cause of paediatric patients' hospital-acquired diarrhoea. A total of 120 individuals, ranging in age from 1 year to 15 years, were admitted to the Department of Paediatrics for the research; their mean age was 6.82 ± 3.46 years. Table 1 describes the research individuals' demographic characteristics. The bulk of research participants fell into the 1-4 year age range, comprising 35.83% ($n=43$) of subjects, 31.66% ($n=38$) of subjects in the 5-8 year age range, 16.66% ($n=20$) of individuals in the 9–12 year age range, and 15.83% ($n=19$) of subjects in the 13–15 year age range. In the current study, there were 39.16% ($n=47$) females and 60.83% ($n=73$) men.

90% ($n=108$) of the trial individuals who were evaluated had diarrhoea that they had acquired in the hospital. Rotavirus was most often found in the age range of 1-4 years, with 7 cases, followed by 5 subjects in 5-8 years, where rotavirus was isolated, 4 subjects in 9-12 years, and 1 subject in 13-15 years, out of 108 research participants who had hospital-acquired diarrhoea in the current investigation. After the rotavirus, six subjects each of *Entamoeba histolytica*, enteropathogenic *E. coli*, *Clostridium difficile*, *C. albicans*, and *Pseudomonas aeruginosa* were frequently

isolated in subjects aged 1-4. Two subjects each of cryptosporidium parvum, Shigella flexneri, Proteus mirabilis, and Klebsiella oxytoca were also frequently isolated. Six participants had enteropathogenic Escherichia coli isolated from them between 5-8 years.

Pseudomonas aeruginosa and C. difficile each had four, Entamoeba histolytica had three, rotavirus had five, and the remaining organisms had two patients apiece. In participants aged 9 to 12, enteropathogenic Escherichia coli was seen in 5, rotavirus in 4, C. difficile in 3, and the other bacteria in either 2 or 1 person. Enteropathogenic Escherichia coli was the primary isolate in the 13–15 age range, appearing in 3 patients; the remaining isolates were found in either 2 or 1 subject, or in none at all (Table 2). After calculating the total number of isolates in the research subjects, it was shown that in 108 patients with hospital-acquired diarrhoea, the majority of patients had Enteropathogenic Escherichia coli (19.16%; n = 23), followed by rotavirus in 14.16% (n=17) subjects, Table 2 displays the percentage of subjects containing C. difficile (11.66%; n = 14), E. histolytica (10%; n = 12), Pseudomonas aeruginosa (6.66%; n = 8), Shigella flexneri (5%; n = 6), C. Albicans, giardia lamblia, Cryptosporidium parvum, Proteus mirabilis, and Salmonella enteritidis in 5 subjects each, and Klebsiella oxytoca (least) in the least number of study subjects (n = 3).

DISCUSSION

The goal of the current cross-sectional clinical investigation was to determine the frequency and cause of paediatric patients' hospital-acquired diarrhoea. A total of 120 individuals, ranging in age from 1 year to 15 years, were admitted to the Department of Paediatrics for the research; their mean age was 6.82 ± 3.46 years.

The bulk of research participants fell into the 1-4 year age range, comprising 35.83% (n=43) of subjects, 31.66% (n=38) of subjects in the 5-8 year age range, 16.66% (n=20) of individuals in the 9–12 year age range, and 15.83% (n=19) of subjects in the 13–15 year age range. In the current study, there were 39.16% (n=47) females and 60.83% (n=73) men. 90% (n=108) of the trial individuals who were evaluated had diarrhoea that they had acquired in the hospital. These demographics were similar to those of the investigations conducted in 2008 by Horan TC et al. and Chikere CB et al., where authors evaluated patients with similar demographics to those of the current study.

Among the participants in this research who contracted diarrhoea in the hospital, rotavirus was found in seven participants in the age range of 1-4 years, five in the age group of 5-8 years (where the virus was isolated), four in the age group of 9-12 years, and one in the age group of 13-15 years. After the rotavirus, six subjects each of entamoeba histolytica, enteropathogenic E. coli, clostridium difficile, C. albicans, and pseudomonas aeruginosa were frequently isolated in subjects aged 1-4. Two subjects each of cryptosporidium parvum, Shigella flexneri, Proteus mirabilis, and Klebsiella oxytoca were also frequently isolated. Within a span of 5 to 8 years, 6 individuals had Enteropathogenic Escherichia coli isolated from them, 5 cases had Rotavirus, 4 cases each of Pseudomonas aeruginosa and C. difficile, 3 cases of Entamoeba histolytica, and 2 cases of each of the remaining organisms.

In participants aged 9 to 12, enteropathogenic Escherichia coli was seen in 5, rotavirus in 4, C. difficile in 3, and the other bacteria in either 2 or 1 person. Enteropathogenic Escherichia coli was the predominant isolate in the 13–15 age group, appearing in 3 patients out of the total; the remaining isolates were observed in either 2 or 1 participant. The present study's outcomes aligned with the research conducted by Pittet D et al in 2008 and Szajewska H et al in 2016, which also found a comparable prevalence of distinct infectious pathogens.

Regarding the evaluation of the total number of isolates in the research participants, it was observed that among 108 patients who had diarrhoea that they had acquired in a hospital,

Enteropathogenic Escherichia coli accounted for 19.16% (n=23) of the subjects, with rotavirus accounting for 14.16% (n=17), C. difficile accounting for 11.66% (n=14), E. histolytica for 10% (n=12), Pseudomonas aeruginosa for 6.66% (n=8), Shigella flexneri for 5% (n=6) of the subjects, C. Albicans, giardia lamblia, Cryptosporidium parvum, Proteus mirabilis, and Salmonella enteritidis for five subjects each, and Klebsiella oxytoca accounting for the least number of study subjects (n=3). The present study's conclusions regarding the infectious agents linked to hospital-acquired illnesses were consistent with those reported by the authors of two previous studies, Rutledge-Taylor K et al. (2012) and Wanke M et al. (2014).

CONCLUSION

Within the constraints of the study, the findings indicate that paediatric patients experience hospital-acquired diarrhoea at a high rate, and that the infectious aetiology was more common in these participants than the non-infectious aetiology. The most frequent cause was an infection with germs. Therefore, it is essential to regularly evaluate the faeces of children admitted to hospitals in order to detect infections early and begin treatment. To lower

the number of episodes of diarrhoea, appropriate cleaning procedures should also be followed. A few drawbacks of the current study included biases related to geographic areas, a limited sample size, and a short monitoring time. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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TABLES

S. No	Characteristics	Percentage (%)	Number (n=120)
1.	Mean age (years)	6.82±3.46	
2.	Age range (years)	1-15	
a)	1-4	35.83	43
b)	5-8	31.66	38
c)	9-12	16.66	20
d)	13-15	15.83	19
3.	Gender		
a)	Males	60.83	73
b)	Females	39.16	47

Table 1: Demographic characteristics of the study subjects

Infectious agents	Isolates based on the age group (years)				Total (n=120)	Percentage (%)
	1-4 (n=48)	5-8 (n=38)	9-12 (n=20)	13-15 (n=19)		
Rotavirus	7	5	4	1	17	14.16
Candida albicans	3	2	0	0	5	4.16
Giardia lamblia	0	2	2	1	5	4.16
Cryptosporidium parvum	2	2	1	0	5	4.16
Entamoeba histolytica	6	3	2	1	12	10

Shigella flexneri	2	2	0	2	6	5
Proteus mirabilis	2	2	1	0	5	4.16
Pseudomonas aeruginosa	3	4	1	0	8	6.66
Klebsiella oxytoca	2	0	1	0	3	2.5
Salmonella enteritidis	0	1	2	2	5	4.16
Clostridium difficile	5	4	3	2	14	11.66
Enteropathogenic Escherichia coli	6	9	5	3	23	19.16
Total	38	36	22	12	108	100

Table 2: Infectious agents based on the age group in subjects with hospital-acquired diarrhea in the study.