



## ETIOLOGY AND PREVALENCE OF HOSPITAL ACQUIRED DIARRHEA IN CHILDREN

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Conflicts of Interest: Nil

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### Abstract:

**Introduction:** Hospital-acquired diarrhea (HAD), among hospitalized children is responsible for increased costs and prolonged hospital stay and also important cause of morbidity and mortality. Especially in children Hospital-acquired diarrhea an important hazard in developed and developing countries occurring about 2–32% of admitted in general medicine wards. Children under the age of three years in developing countries experience on an average of three time of diarrhea every year. On each and every episode of diarrhea, it contributes deprivation to significant nutrition which is necessary for child growth. Patients in the hospital stay may face the additional risk of acquiring infections due to contact with other patients, contaminated hospital surfaces or healthcare workers and in low-income hospitals infection control is often less meticulous which could be higher risk.

**Aim:** The main objective is to study the etiology and prevalence of hospital acquired diarrhea in children.

**Material and methods:** In this study total 100 patients were included with the age between 1 year old to 15 years old who were admitted to the paediatric ward for reasons other than diarrhoea and stayed for more than 3 days. Detail history from all the patients were noted including laboratory investigation. From each and every patient stool sample were collected in disposable clean containers and send to microbiology laboratory for processed. Several diagnostic laboratory tests were done for the detection of viral, bacterial, parasitic and fungal agents. Enzyme linked immunosorbent assay (ELISA) were done for the detection of Clostridium difficile toxins and latex agglutination test were done for detection of human rotavirus antigen.

**Result:** In this study total 100 hospitalized children between the ages 1 to 15 years old were examined. Out of these 82 children (82%) were diagnosed as hospital acquired diarrhea. out of total 100 patients majority were male children(63%) and followed by female(37%) children. Out of total 100 children, children with the age group 1-4 years showed maximum (38%) of hospital acquired diarrhea followed by 4-8 years (29%), 8-12 years (18%) and 12-16 years(15%) respectively.

**Conclusions:** This study also revealed a high prevalence of hospital acquired diarrhea our area and the infectious causes were more than the non-infectious causes, with bacterial predominance among the infectious agents. Therefore this study recommends routine general stool examination, stool culture/sensitivity for detection for microbial infection and Cl. difficile detection by ELISA methods for all patients with hospital acquired diarrhea to identify the causative agent. Hence, healthcare strategy and campaign should be focused on specific hospital staff and community area must be available.

**Keywords:** Children, Hospital acquired diarrhea, Enteropathogenic Escherichia coli(EPEC)

### Introduction

Hospital-acquired diarrhea (HAD), among hospitalized children is responsible for increased costs and prolonged hospital stay and also important cause of morbidity and mortality<sup>i</sup>. Especially in children Hospital-acquired diarrhea an important hazard in developed and developing countries occurring about 2–32% of admitted in general medicine wards<sup>ii, iii</sup>. Especially in the cases of children diarrhoeal disease is the most common disease which causes mortality and morbidity in worldwide mainly in developing countries. According to WHO about 525,000 children under five years worldwide die due to diarrhoeal diseases each year with 1.7 billion cases of diarrhoeal disease every year<sup>iv</sup>. Children under the age of three

years in developing countries experience on an average of three time of diarrhea every year. On each and every episode of diarrhea, it contributes deprivation to significant nutrition which is necessary for child growth<sup>v</sup>. In developed countries, long term uses of broad spectrum antibiotics may disturb normal colonic flora followed by colonization of Clostridium difficile and this may be the common cause of new onset of diarrhea among hospitalized patients<sup>vi</sup>. Patients in the hospital stay may face the additional risk of acquiring infections due to contact with other patients, contaminated hospital surfaces or healthcare workers and in low-income hospitals infection control is often less meticulous which could be higher risk<sup>vii, viii</sup>. Research from developed and

developing countries suggest that age, length of hospitalization, immune status, nutritional status, and exposure to gastrointestinal procedures such as endoscopy and nasogastric intubation are host-related risk factors for hospital-acquired diarrhea<sup>ix, x</sup>. For the control and spread of Hospital-acquired diarrhea from contaminated food is and main concern in hospitals and nursing homes. Due to untrained staff using unsafe practices for the storage, preparation and handling of food frequently. Furthermore quality of drinking water with limited resources is often unsafe controlling outbreaks of waterborne infectious diarrhea are continuing problem<sup>xi</sup>. The main objective is to study the etiology and prevalence of hospital acquired diarrhea in children.

#### Material and methods:

This is a cross sectional study carried out at SSPM's Medical College Padve, Sindhudurg and hospital in the department of paediatric with the collaboration with the department of microbiology. In this study total 100 patients were included with the age between 1 year old to 15 years old who were admitted to the paediatric ward for reasons other than diarrhoea and stayed for more than 3 days. For the diagnosis of the hospital acquired diarrhea in the hospitalized patients The Centers for Disease Control and Prevention (CDC)<sup>xii</sup> definition of hospital diarrhoea was used, as in a hospitalized patient acute onset of diarrhea with a period of at least 3 days of hospitalization prior to the onset of diarrhea. Detail history from all the patients were noted including laboratory investigation. From each and every patient stool sample were collected in disposable clean containers and send to microbiology laboratory for processed. Several diagnostic laboratory tests were done for the detection of viral, bacterial, parasitic and fungal agents. Enzyme linked immunosorbent assay (ELISA) were done for the detection of Clostridium difficile toxins and latex agglutination test were done for detection of human rotavirus antigen.

#### Result:

In this study total 100 hospitalized children between the ages 1 to 15 years old were examined. Out of these 82 children (82%) were diagnosed as hospital acquired diarrhea. out of total 100 patients majority were male children(63%) and followed by female(37%) children as shown in table no 1 below.

**Table 1:** showing the total no of children according to their gender

gender	no	%
male	63	63
female	37	37
Total	100	100

Out of total 100 children, children with the age group 1-4 years showed maximum (38%) of hospital acquired diarrhea followed by 4-8 years(29%), 8-12 years(18%) and 12-16 years(15%) respectively as shown in table no 2 below.

**Table 2:** showing age groups distribution of children with hospital acquired diarrhoea

Age group	no	%
1-4	38	38
4-8	29	29
8-12	18	18
12-16	15	15
Total	100	100

Among all the patients, in 82% of the patients showed various causative agents as variety of microbial causative agents were isolated and identified and remaining 18% was no obvious causative agent detected. Out of the total single infectious agent causing 63.2% and 15.9% had mixed infections of bacterial–bacterial, bacterial–parasitic or bacterial–viral. Enteropathogenic Escherichia coli (EPEC) was most commonly isolated microbial agent 23.2% cases followed by parasitic infection 20.8% and rotavirus in 17.1% respectively. In about two-thirds of isolates, 3 organism's isolates were found. Remaining organism was found in low frequency as shown in table no 3 below. Patients with the age group 1-4 years of age were most affected by hospital acquired diarrhea followed by age group 4-8 years. In both the age group EPEC was most predominant which is followed by Rota virus. The opportunistic microorganisms like Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella oxytoca were detected in age group 1-4 years, and they represented 15% of the total isolates. In this study out of total hospital acquired diarrhea bacterial infection 58.6% were most common which is followed by parasitic infection 20.8%, viral 17.1% and fungal infection 3.7% respectively.

**Table 3:** Age distribution of infectious agents in stool samples of children with nosocomial diarrhoea diagnosed

Infectious agent	Isolates by age group				total	%
	1-4	4-8	8-12	12-16		
Enteropathogenic Escherichia coli	5	8	4	2	19	23.2
Clostridium difficile	4	3	3	1	11	13.4
Salmonella enteritidis	0	1	2	1	4	4.9
Klebsiella oxytoca	1	0	1	0	2	2.4
Pseudomonas aeruginosa	2	3	1	0	6	7.3
Proteus mirabilis	1	1	1	0	3	3.7
Shigella flexneri	1	1	0	1	3	3.7
					0	0.0
Entamoeba histolytica	4	2	2	1	9	11.0
Cryptosporidium parvum	2	1	1	0	4	4.9
Giardia lamblia	0	1	2	1	4	4.9
					0	0.0
Candida albicans	2	1	0	0	3	3.7
Rotavirus	6	4	3	1	14	17.1
Total	28	26	20	8	82	100.0

**Discussion:**

Hospital acquired diarrhea is an acute diarrhoea defined by the place of infection and the time of onset after 72 hours. In order to exclude microorganisms the 3-day cut-off period is used which may be acquired from the community and stay dormant in the body without clinical evidence<sup>xiii</sup>. A study reported from northern Brazil a higher prevalence of hospital acquired diarrhoea among children was about 40% which showed less than this study as it shows higher prevalence whereas in south India showed prevalence to be 20% among hospitalized children with age less than 36 months<sup>xiv, xv</sup>. This difference in prevalence may be related to different factors such as hygiene practices, sanitation level of the hospitals and type of microorganisms endemic in the area. While admitted in the hospital and stay for longer period in hospital with limited routine infection control that may increase the possibility of exposure to potential pathogens at hospital settings which might cause new onset of diarrhea. Moreover, in hospital many caregivers had diarrhea while caring for ill patients and that also pose one of the risk factors to patients<sup>xvi, xvii</sup>. In this study showed that a high prevalence of cases were in children with the age below 5 years and this prevalence was agreed with other studies from Iraq<sup>xviii</sup> and also from Saudi Arabia<sup>xix</sup>. In India there are many studies which showed that the incidence of diarrhoea among children is high in the age between

4 months and 2 years<sup>xx</sup>. Many studies showed that gastrointestinal system is most frequent site as in the other general pediatric service<sup>xxi</sup>. In this study EPEC were most common isolated organism and rotavirus were most common viral agent causing infectious diarrhoea in children which is also similar to the study of Jindal et al<sup>xxii</sup>. as it showed 21.4% of cases of infectious diarrhoea were due to EPEC. A study from Turkey by Oguz F et al<sup>xxiii</sup> showed *Cl. Difficile* as 20.7% which is similar to this study.

In this study period there was no clinical evidence of cholera due to *Vibrio cholerae* and diarrhea with food poisoning due to *Staphylococcus aureus* was found. Other bacteria like *Campylobacter jejuni* and *Yersinia enterocolitica* were also not found that are sometimes involved in hospital acquired diarrhoea among children.

**Conclusions:**

In children diarrhea is a very important issue in developing countries like India. This study also revealed a high prevalence of hospital acquired diarrhea in our area and the infectious causes were more than the non-infectious causes, with bacterial predominance among the infectious agents. Therefore this study recommends routine general stool examination, stool culture/sensitivity for detection of microbial infection and *Cl. difficile* detection by ELISA methods for all patients with hospital acquired diarrhea to identify the causative

agent. Hence, healthcare strategy and campaign should be focused on specific hospital staff and community area must be available.

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