Viral Diarrhoea in Children of Dhulikhel Hospital, Nepal and Medical University of Innsbruck, Austria

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Abstract

BACKGROUND

Viral diarrhoea is still a major cause of childhood morbidity and mortality worldwide, with high morbidity in children younger than 5 years of age particularly in developing countries. The objective of this study was to determine the frequency of viral diarrhoea in children less than 5 years of age at Kathmandu University Hospital/Dhulikhel Hospital (DH), Nepal and Medical University of Innsbruck (MUI), Austria and to compare the clinical presentation and the common cause of acute childhood diarrhoea in the two institutions.

METHODS

This was a hospital based, comparative study done in two different hospitals DH and MUI. A total of 200 cases of under 5 years old children, among which 100 cases attending DH from 1st December 2011 to 29th February 2012 and 100 cases attending MUI from 1st March 2012 to 31st May 2012, presented with acute onset of diarrhoea were enrolled in the study. The fresh stool specimens were analysed in the laboratory of individual hospital in order to examine the common pathogens.

RESULTS

Majority of children were classified as no dehydration (DH: 75% and MUI: 74%); in DH 5% were classified as severe dehydration, whereas in MUI it was null. In MUI, 96% of children were brought within 3 days of illness, whereas only 32% were brought in DH which was statistically significant (p=<0.001). In DH 37% of cases required hospital admission, among which 7 cases needed PICU, whereas in MUI, 52% of cases were admitted (p=0.03); and no cases needed PICU. The mean hospital stay was 1.1±1.7 days and 1.3±1.8 days in DH and MUI, respectively. Rotavirus was positive in significant number of cases in DH (66%) (p=<0.001). Other pathogen detected in DH was Adenovirus (13%). The most common pathogen detected in MUI was Norovirus (16%), followed by Rotavirus (11%) and Adenovirus (9%).

CONCLUSIONS

Incidence of acute diarrhoea was highest below 24 months of age. Rotavirus and Norovirus was the most common cause of children diarrhoea in Nepal and Austria, respectively.

KEYWORDS: Children, diarrhoea, dehydration, Rotavirus

Introduction

Diarrhoea is a clinical syndrome of diverse etiology, associated with passage of more than three loose stools in a 24 hours period and often accompanied by other clinical sign and symptoms including vomiting, fever, dehydration and electrolyte disturbances [1]. Diarrhoea is a major health problem among children. In addition, it remains a major cause of childhood morbidity and mortality worldwide [2]. The highest mortality from diarrhoea is in children under the age of five, highlighting an urgent need for focused interventions to prevent diarrhoeal disease in this age group [3]. Five million children under the age of 2 years die from diarrhoeal disease in developing countries each year and Rotavirus infections account for about 20% of these deaths [4]. Nepal, being a developing country, faces similar health problem as other developing countries; Diarrhoea and gastroenteritis come in second position among top ten diseases admitted to hospital [5]. In industrialised countries, mortality rates associated with Rotavirus gastroenteritis are low, but Rotavirus remains a significant paediatric disease, responsible for hospitalisation and nosocomial infection in many children [6, 7]. Norovirus causes 900,000 clinical visits in industrialized countries and up to 200,000 deaths in children from developing countries [8].

Inappropriate environmental condition and weak economical status are the important risk factors of acute diarrhoea. Worldwide diarrhoea related mortality has decreased, mainly because of better therapeutic interventions along with provision of safe drinking water, improvement of sanitation and popularization of primary health care activities [9]. In Nepal, due to lower socio-economic status and poor hygienic condition of the people, intestinal parasitosis is very much prevalent and intestinal pathogens are important causative agents of diarrhoea and are one of the major public health problems of the country [10].

This study undertook prospective diarrhoeal surveillance among children less than 5 years of age presenting in DH and MUI. Since DH is the only tertiary level health care centre in the district, majority children of the vulnerable section of population suffering from diarrhoea and other illness are likely to attain this hospital. After pneumonia, diarrhoea is the second commonest cause of infection related disease among under 5 years children admitted in DH. The result of this study is expected to encourage the health care professionals in terms of diagnosis and treatment plan of childhood diarrhoea. The primary objective of this study was to assess and compare the frequency and clinical characteristics of childhood diarrhoea, diarrhoea severe enough to bring a child to medical attention. We expect that these results will also be useful to think about vaccine requirements in a developing country like Nepal.

Methods

This hospital based, prospective, non–interventional, comparative study was carried out in two different hospitals at Kathmandu University Hospital/Dhulikhel Hospital (DH), Nepal and at Medical University of Innsbruck (MUI), Austria, Department of Paediatrics.

In DH data were collected from 1st December 2011 to 29th February 2012, In MUI data were collected from 1st March 2012 to 31st May 2012.

Children under 5 years of age presented with acute onset of diarrhoea with or without nausea and vomiting attending in outpatient, emergency and those admitted in inpatient department were enrolled in the study with purposive sampling technique. Children with dysentery, newborns less than 28 days, children with persisting diarrhoea more than 14 days and children with other associated chronic disease were excluded.

Total sample collected was 200 (100 cases from DH and 100 cases from MUI).

The definition of diarrhoea, dehydration status and its management was assessed and classified according to the guidelines of the World Health Organization (WHO), which is followed in the Integrated Management of Childhood Illness (IMCI) training.

Mild, moderate and severe fever was defined as a rectal temperature of 37.7 ^{0}C - 38.5 ^{0}C, 38.6 ^{0}C - 39.5 ^{0}C and >39.5 ^{0}C respectively.

If an organism was identified from the stool sample, the child was classified as “infected” with that organism. “Undiagnosed diarrhoea” included any episode in which a studied virus was undetected.

All the 200 stool specimens were analysed in the respective hospital laboratories. One faecal specimen was collected from each patient; freshly passed stool samples were collected in clean plastic containers. All the samples were examined within 2 hours of collection. The specimen was subjected to naked eye examination for

consistency, colour, and atypical components (mucus, blood and parasites). Following the manufacturer's instructions the CerTest Rota-Adeno Card (Biotec, Zaragoza, Spain), an immunochromatographic test for Rotavirus and Adenovirus detection in stool specimens was used for routine testing. The sensitivity for Rotavirus and Adenovirus detection of this test system is 100% and 90% respectively, and the specificity for Rotavirus and Adenovirus detection of this test system is 99% and 100% respectively [11,12]. All the stool samples were collected in clean containers and the assay done right after collection. The samples were stored in the refrigerator (2-4^{0}C) for 1 day if the test were to be conducted the next day. The samples were brought to room temperature before the tests. In MUI all the stool specimens were also tested for Norovirus using similar ELISA kits (CerTest Rota-Adeno-Noro Card, Biotec, Zaragoza, Spain). Due to lack of facility and financial constraint stool specimens for Norovirus could not be tested in DH.

Data was entered and analysed using SPSS (Statistical Package for Social Science) version 20. Data analysis was done using both descriptive (mean and percentage) and inferential (χ2 test) statistics. Statistical test was considered significant at 0.05 level of confidence.

The research proposal was submitted to the Ethical Review Board of Kathmandu University School of Medical Sciences for approval. A written informed consent from parents or guardians of the enrolled child was taken prior to participation and stool collection for the study.

For the research purpose ELISA kits used for the detection of Rotavirus and Adenovirus antigen in DH were provided by MUI, Department of Microbiology. No financial burden was incurred to patient's expense, except for routine stool examination and routine charges as per hospital policy.

Results

A total of 200 cases of under 5 years old children, among which 100 cases attending DH from 1st December 2011 to 29th February 2012, and 100 cases attending MUI from 1st March 2012 to 31st May 2012, fulfilling the inclusion criteria and whose parents gave consent to participate in the study were enrolled and studied. During this different study period, total of 274 and 101 under five years old children with diarrhoea attended DH and MUI respectively.

Majority of the study population were in the age group of 1 month to 12 months in both DH (48%) and MUI (45%). Children less than 24 months occupied 77% and 73% of the study population in DH and MUI respectively.

The mean age was 17.6 months (S.D ± 14.4 months) and 20.7 months (S.D ± 18.1 months) in DH and MUI respectively. Out of 100 children studied in each institution 69% were males and 31% were females in DH, whereas 53% were males and 47% were females in MUI. Although male children were seen to suffer more from diarrhoea in DH, this difference in sex was not statistically significant.

Majority of stool samples tested positive for Rotavirus (66%) and Adenovirus (13%) in DH. Stools were not tested for Norovirus in DH. Similarly, stool was tested positive for Norovirus (16%), Rotavirus (11%), and Adenovirus (9%) in MUI.

Rotavirus was detected in significantly high number of cases in DH (66%), whereas only 11% of cases were detected in MUI (p=<0.001).

Comparing infected cases with age of the children in DH, more than 78% (52 cases) of Rotavirus positive cases were below 24 months of age *(p=0.7)*, similarly more than 69% (9 cases) of Adenovirus positive cases were below 24 months of age *(p=0.4)*. The mean age of Rotavirus positive case and Adenovirus positive case was 16.3 months and 19.7 months respectively.

Comparing infected cases with age of the children in MUI, 75% (12 cases) of Norovirus positive cases were below 24 months of age *(p=0.8)*, more than 54% (6 cases) of Rotavirus positive cases were below 24 months of age *(p=0.1)*, similarly more than 88% (8 cases) of Adenovirus positive cases were below 24 months of age *(p=0.2)*. The mean age of Norovirus, Rotavirus and Adenovirus positive case was 21.8 months, 27.0 months and 29.1 months respectively.

Comparing between the diarrheal cases in DH and MUI, significantly 96% of children were brought within 3 days of illness in MUI, whereas only 32% were brought within 3 days of illness in DH which shows that parents are seeking for medical service in MUI significantly earlier than in DH (p=<0.001) [Table 1].

The mean duration of illness prior presentation to hospital was 3.2±1.5 days and 1.7±1.1 days in DH and MUI respectively.

Table 1. Correlation of clinical parameters between DH and MUI

	DH n=100	MUI n=100	p-value
Age (≤24 months)	77	73	0.5
Duration of illness prior presenting to hospital (≤3 days)	32	96	0.001
History of fever	36	30	0.3
Dehydration	25	26	0.8
Hospital admission	37	52	0.03

In DH 97% of Rotavirus positive cases had duration of illness prior presentation to hospital of less than 6 days with the maximum of 9 days in 1 case, whereas all Adenovirus positive cases were brought within 6 days of illness, with the maximum of 6 days in 1 case. The mean duration of illness for Rotavirus and Adenovirus positive cases prior presenting to the hospital were 3.2 days and 2.9 days, respectively.

In MUI all the Norovirus, Rotavirus and Adenovirus positive cases were brought to the hospital within 3 days of illness. The maximum duration of illness prior presentation to hospital for Norovirus, Rotavirus and Adenovirus positive cases were 3 days, 2 cases in each. The mean duration of illness prior presenting to hospital for Norovirus, Rotavirus and Adenovirus positive cases were 1.62 days, 1.63 days and 2.0 days, respectively.

The majority had no history of fever in both the institutions (DH 64% and MUI 70%). Comparing children having history of fever (DH 36 cases and MUI 30 cases) with their age group, more than 77% (28 cases) and 80% (24 cases) of children having history of fever were below 24 months of age in DH (p=0.9) and MUI (p=0.3) respectively. Although the majority of children having fever with diarrhoea were below 24 months in both the institutions, this difference was statistically not significant.

Out of the 66 Rotavirus positive cases in DH, more than 62% (41 cases) had no history of fever (p=0.5), whereas among the 13 Adenovirus positive cases more than 69% (9 cases) had history of fever (p=0.01).

Out of the 16 Norovirus positive cases in MUI, 50% (8 cases) had history of fever (p=0.07). Similarly, out of 11 Rotavirus positive cases more than 81% (9 cases) had history of fever (p=0.0001). However, out of 9 Adenovirus positive cases more than 88% (8 cases) had no history of fever (p=0.2).

Among all the 100 children assessed in each institutions majority were classified as no dehydration in both the institutions (DH 75% and MUI 74%). In DH 20% were classified as some dehydration and 5% as severe dehydration, whereas in MUI 26% were classified as some dehydration; however, there were no cases of severe dehydration in MUI.

Comparing children having dehydration (DH 25 cases and MUI 26 cases) with their age group, 80% (20 cases) and 84% (22 cases) of children having some form of dehydration was found to be below 24 months of age in DH (p=0.7) and MUI (p=0.1) respectively. The mean age of some dehydration was 14.8 months and 16.2 months in DH and MUI respectively.

Table 2. Relation between infected cases with signs of dehydration in DH and MUI.

Infection	Yes	No	p-value
DH			
Rotavirus (+) n=66	15 (22.7%)	51 (77.3%)	0.4
Adenovirus (+) n=13	2 (15.4%)	11 (84.6%)	0.5
MUI			
Norovirus (+) n=16	8 (50.0%)	8 (50.0%)	0.02
Rotavirus (+) n=11	6 (54.5%)	5 (45.5%)	0.03
Adenovirus (+) n=9	5 (55.6%)	4 (44.4%)	0.2

Comparing infected cases with clinical signs of dehydration in DH, more than 77% (51 cases) of Rotavirus positive cases had no signs of dehydration (p=0.4), similarly more than 84% (11 cases) of Adenovirus positive cases had no signs of dehydration (p=0.5) [Table 2].

Comparing infected cases with clinical signs of dehydration in MUI, 50% (8 cases) Norovirus positive cases had signs of dehydration (p=0.02); similarly, more than 54% (6 cases) of Rotavirus positive cases had signs of dehydration (p=0.03); and more than 55% (5 cases) of Adenovirus positive cases had signs of dehydration *(p=0.2)* [Table 2].

Among the 100 cases with diarrhoea in each institution, in DH 37% of cases needed hospital admission among which 7 cases needed PICU care; In MUI 52% of cases needed hospital admission which was significantly higher in comparison to hospital admission in DH (p=0.03). However, no cases needed PICU care in MUI. There were no mortality due to diarrhoea within the study period in either of the institutions.

Comparing between admitted cases (DH 37 cases and MUI 52 cases) with their age group, 81.1% (30 cases) and 78% (41 cases) were below 24 months of age in DH (p=0.5) and MUI (p=0.1) respectively.

Comparing between the hospital admitted and infected cases in DH, among the 66 Rotavirus positive cases 36.4% (24 cases) needed hospital admission (p=0.8) and among 13 Adenovirus positive cases 46.2% (6 cases) needed hospital admission (p=0.5) [Table 3].

Table 3. Correlation between infected cases with inpatient and outpatient care in DH and MUI

Infection	Inpatient	Outpatient	p-value
DH			
Rotavirus (+) n=66	24 (36.4%)	42 (63.6%)	0.8
Adenovirus (+) n=13	6 (46.2%)	7 (53.8%)	0.5
MUI			
Norovirus (+) n=16	11 (68.8%)	5 (31.2%)	0.1
Rotavirus (+) n=11	10 (90.9%)	1 (9.1%)	0.006
Adenovirus (+) n=9	9 (100.0%)	0 (0.0%)	0.003

Comparing between the hospital admitted and infected cases in MUI, among the 16 Norovirus positive cases more than 68% (11 cases)(p=0.1), similarly among the 11 Rotavirus positive cases more than 90% (10 cases)(p=0.006) and among 9 Adenovirus positive cases 100% (9 cases) (p=0.003) needed hospital admission [Table 3].

The mean hospital stay was 1.1±1.7 days and 1.3±1.8 days in DH and MUI respectively.

In DH more than 90% (60 cases) of Rotavirus positive cases had the hospital stay of less than 3 days with the maximum of 9 days in 1 case, whereas all the Adenovirus positive cases had the hospital stay of less than 3 days with the maximum of 3 days in 3 cases. The mean duration of hospital stays for Rotavirus and Adenovirus positive cases were 1.7 days and 1.5 days respectively.

In MUI 75% (12 cases) of Norovirus positive cases had the hospital stay of less than 3 days with the maximum of 7 days in 2 cases, more than 72% (8 cases) of Rotavirus positive cases had the hospital stay of less than 3 days with the maximum of 5 days in 3 cases, whereas all the Adenovirus positive cases (9 cases) had the hospital stay of less than 3 days with the maximum of 3 days in 2 cases. The mean duration of hospital stays for Norovirus, Rotavirus and Adenovirus positive cases were 2.6 days, 2.8 days and 2.0 days respectively.

Intravenous (IV) fluids were needed in 26% and 40% of cases in DH and MUI respectively. Zinc supplementation was given in 69% cases in DH. Eighteen percent cases were treated with oral antibiotics in DH. No antibiotics were found to be used in MUI. No anti-diarrhoeal, anti-secretary or anti-motility drugs were used in both the institution.

Discussion

Children under 5 years presented with acute onset of diarrhoea with or without nausea and vomiting seen in outpatient, emergency and those admitted in inpatient paediatric department of DH and MUI meeting the inclusive criteria were enrolled in the study. Their clinical presentation and the common cause of acute childhood diarrhoea in the two institutions were studied and compared.

Incidence of diarrhoea was found to be more in males (69%) in DH, while there was no significant difference in sex of patients of diarrhoea in MUI. Since this study was a hospital based study, the culture of male preference may have played some role for possible increase number of hospital visits for a male child in DH. This result was also supported by a similar study of diarrhoea done among children in eastern Nepal, where incidence of diarrhoea was seen more in male children (67.5%) [13]. The explanation to this male predominance remains unclear, and this difference bears no statistical significance.

In this study the highest number of diarrhoeal cases were found in children less than 12 months in both DH (48%) and MUI (45%), followed by 13 to 24 months age group (DH 29%, MUI 28%) and the number of diarrhoeal cases decreased thereafter. In a similar study of diarrhoea done among children in eastern Nepal, majority (70.9%) of diarrhoea were observed in patients between 6 months and 2 years of age [13]. The same picture of age predisposition was observed in studies from Bangladesh [14, 15] and India [16], similarly also from studies done among children in America [17]. The young age, inadequate breastfeeding, malnutrition, low socioeconomic status, poor maternal literacy, poor sanitation and hygiene practices of the mother including poor handling of water at the household level, indiscriminate stool disposal by the mothers and lack of hand-washing before feeding their children may be associated with a

higher incidence of diarrheal diseases in children below 24 months of age.

In developed countries like Austria, acute childhood diarrhoea is a common reason for presentation to general practice or emergency departments and for admission to hospital. In this study the mean duration of illness prior presenting to hospital was 3.2 days and 1.7 days in DH and MUI respectively. Children with diarrhoea in MUI were found to be brought significantly earlier to the hospital than DH. Ninety six percent of children were brought within 3 days of illness in MUI, whereas only 32% were brought within 3 days of illness in DH ($p = 0.001$). The easy accessibility, better living standard and higher educational level of the parents in addition to the well-developed health insurance system in the country may be the contributing factors for the early presentation of diarrhoeal cases in MUI. Most of the complications associated with gastroenteritis are related to delays in diagnosis and delays in the institution of appropriate therapy. Without early and appropriate rehydration, many children with acute diarrhoea would develop dehydration with associated complications [18].

Although most children with gastroenteritis do not require admission to hospital, many are treated as inpatients each year. Once admitted they often remain in the hospital for several days. This is a significant burden for the health services [19]. Admission also carries a serious risk of spread to other children in the hospital, some of whom may be highly vulnerable as a consequence of their own medical conditions [20]. In this study in DH, 25% cases had signs of dehydration among which 5% were severely dehydrated, whereas in MUI 26% had some dehydration; however, no cases with severe dehydration were seen in MUI. In both DH and MUI majority of children having dehydration was found to be below 24 months of age (DH 80%, MUI 84.6%). Similarly, in both institution most of the children having history of fever were also below 24 months of age (DH 77.8%, MUI 80%). More number of diarrhoeal cases were found to be admitted in MUI (52%) compared to DH (37%) ($p=0.03$). Among the children who needed admission majority were below 24 months of age in both the institutions (DH 77%, MUI 73%). The significant number of diarrhoeal cases being admitted in MUI may be due to the fact that the parents are more concerned about their child's health and also may be because of the better health insurance system in the country. Seven percent cases needed PICU care in DH. However no cases needed PICU care in MUI. No deaths were seen in both the institutions due to diarrhoea during the study period.

In this study in DH, majority of stool samples tested positive for Rotavirus (66%) followed by Adenovirus (13%), whereas in MUI stool samples were tested positive for Norovirus (16%) followed by Rotavirus (11%) and Adenovirus (9%). Most of the infected cases were below 24 months of age, which was similar to other studies. Majority of infected cases were found to have no signs of dehydration. Bresee J et al in 2004 concluded in the first Report from the Asian Rotavirus Surveillance Network that 45% of acute diarrheal hospitalizations in children less than 5 years of age were due to Rotavirus [21]. Study done among children in eastern Nepal showed rota antigen in 38.7% samples [13].The large number of Rotavirus positive cases detected in our study may also be due to the fact that the study was carried out during the winter months when we expect more numbers of Rotavirus diarrhoea in the community.

In this study, majority of children were managed with Low Osmolality Rehydration Solution (ORS) in both the institutions. IV fluids were needed in 26% and 40% of cases in DH and MUI respectively. Zinc supplementation was also given in majority of cases (69%) in DH. Minority of cases (18%) were treated with oral antibiotics in DH. However, antibiotics were found to be used in 29% of children prior to presentation to the hospital in DH, some of which were continued during the illness. No anti-diarrhoeal, anti-secretary or anti-motility drugs were used in both the institution. No antibiotics were found to be used in MUI. There is strong evidence that zinc supplementation in children with diarrhoea in developing countries leads to reduced duration and severity of diarrhoea and could potentially prevent a large proportion of cases from recurring [18].

Many developing countries struggle with huge disease burdens of diarrhoea where a wider approach to diarrhoea prevention may be required. Preventive strategies may be of relevance to both developed and developing countries [18]. Promotion of exclusive breast-feeding, improved complementary feeding practices, improved water and sanitary facilities, promotion of personal and domestic hygiene along with Rotavirus immunization must be reinforced.

In 1998, a quadrivalent Rhesus Rotavirus-derived vaccine was licensed in the United States but subsequently withdrawn due to an increased risk of intussusceptions. Subsequent development and testing of newer Rotavirus vaccines have led to their introduction in most developed countries and approval by the WHO in 2009 for widespread use in developing countries. Emerging evidence indicates that the introduction of these vaccines is associated with a significant reduction in severe diarrhoea and associated mortality [18]. Since July 2007 oral Rotavirus vaccination is part of the routine vaccination program in Austria. Prior to vaccination nearly 1 in 60 children younger than 2 years of age, was hospitalised because of Rotavirus gastroenteritis in Austria. The immunization status for age according to the Expanded Programme on Immunization (EPI) was completed in all the children (100%) enrolled in this study in DH which highlights the success of National Immunization Programme in Nepal. During the study period EPI schedule in Nepal did not include Rotavirus vaccine which is one of the major causes of acute diarrhoea in children. In this study Rotavirus was detected in significant number of cases in DH (66%), whereas only 11% of cases were detected in MUI (p=0.001). This shows that Rotavirus vaccination plays a major role in reducing childhood diarrhoea. A safe and an effective Rotavirus vaccine would have a major effect on reducing diarrhoea mortality in developing countries like Nepal. Difference in Rotavirus genotypes are seen emerging in various communities. There are limited studies describing the distribution of Rotavirus strains in our community. Our understanding of transmission and prevention of childhood diarrhoeal disease would be incomplete without studies that investigate Rotavirus strains circulating in the community.

The main limitation of the study was its hospital based study, limited sample size and limited laboratory facilities. As the study was conducted in a tertiary care hospital mostly the severe cases or those who can afford were referred or brought to the hospital. Most of the simple cases of diarrhoea are treated locally at home or at the local health facility. Several different groups of viruses have been shown to be responsible for high incidence of acute viral gastroenteritis among children during their first few years of life. Rotavirus and Adenovirus are the most important causes of early childhood gastroenteritis in both developed and developing countries, but concerning the limitation of our study other groups of viruses could not be identified and characterization of their different strains and genotypes could not be attempted due to lack of facilities. Seasonal variation of diarrhoeal cases could not be assessed due to specified time constraints of the study. However, the differences in detection rates could also be partially attributed to the study design which was conducted in different time interval in two different places and generalizability of the data in two different institutions. These limitations have to be kept in mind when interpreting and discussing the results of the study.

Conclusions

Viral diarrhoea is still the most common cause of childhood diarrhoea in developed and developing countries. Interventions should concentrate on children less than 24 months of age, where disease is most common. An environmental health education program, along with water supply and sanitation intervention, may be an effective mitigation measure to reduce diarrheal diseases in Nepal. Most children are not dehydrated and can be managed using low osmolality ORS at home or in primary health care centres. Rotavirus is still the most common cause of acute gastroenteritis in developing countries like Nepal and vaccination will have a major impact on disease rates, morbidity, and mortality. The result of this study will help us to understand the etiology of the increasing childhood diarrhoea in the surrounding community, and also guide us in the further management of viral diarrhoea and to think about the need of a safe and an effective Rotavirus vaccine in a developing country like Nepal. More research should be focused on the issue of childhood diarrhoea and the emerging newer Rotavirus genotypes in the community.

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Conflict of Interest

None declared

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