Co-Relation of Standards of Sanitation with Severity and Rotavirus Positivity in Children Having Diarrhea - A Tertiary Care Center of Gujarat, India

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Abstract

Introduction: The contribution of rotavirus gastroenteritis to diarrheal morbidity and mortality in developing countries is due to the epidemiologic profile of the disease.Sanitation improvement and hygiene education, can have significant improvement. **Aims & Objectives:** To find out the correlation co-efficient between Standard of sanitation using Briscoe scale and rotavirus positivity, and between Standard of sanitation using Briscoe and severity using VesikariClinical Severity score. **Methods:** A co- relation survey was conducted in a tertiary care center over a period of 3 years in 450 children less than 5 years of age diagnosed with acute gastroenteritis (≥ 3 unformed stools in last 24 hours) and requiring in-patient treatment. Children hospitalized for more than 48 hours and those with primary diagnosis other than acute gastroenteritis were excluded. Those fulfilling the selection criteria and willing to participate were assessed for Standards of sanitation(using Briscoe scale), Severity of diarrhoea(Using Vesikari scale) and Rotavirus positivity(by PCR).Statistical analysis was done & level of significance was set at 5%. **Results:** A negative linear co-relation was found between standardsof sanitation and rotavirus positivity(*r*=0.-481) andbetween standardsof sanitation and severity (*r*=-0.65); former indicating that higher score on Briscoe scale shows lower rotavirus positivity and latter indicating less severity in those with higher levels of sanitation. **Conclusion:** Higher levels of sanitation co-relates with less rotavirus positivity and severity of gastroenteritis, emphasizing the importance of appropriate sanitation in children among a tertiary care center in Gujarat, India.

Introduction

Rotavirus diarrhea is the most common cause of diarrhea in infancy. It is more common in winter months, resulting in disease more severe in 3-24 months of age, since <3 months are naturally protected due to transplacental antibodies and breastfeeding. Rotavirus diarrhea accounts for nearly 5-10 million deaths per year globally, of which India accounts approx.22% of deaths.[1]Rotavirus positivity amongst hospitalized children is 6-45%(20.8%)According to IRSN(2005-2007)40% of children had rotavirus diarrhea. The

IRSN estimated that rotavirus approximately caused 113,000 deaths in India, with 34% of diarrheal deaths with children under 5 attributed to rotavirus. This corresponded to a mortality rate of 4.14 deaths per 1000 live births. Greatest incidence is between ages 6-23 months.[2]Poor or inadequate sanitation and unsafe drinking water are the cause of more than 1.5billion episodes of diarrhoea, mostly from bacterial and parasitic etiology.
Sanitation improvement, in association with hygiene education, can have significant effects on health leading to reduced morbidity and mortality and improved nutritional status. India being a developing country, it is important to highlight the epidemiological trends and co-relates of sanitation with occurrence of rotavirus disease. Hence the purpose of the study was to find out the co-relation of sanitation and rotavirus positivity and sanitation and severity of diarrhea.

Aims & Objectives

To determine epidemiological trends such as the standards of sanitation and the severity of rotavirus positivity in children having diarrhea in a tertiary care center of Gujarat, India. To find out the correlation co-efficient between Standard of sanitation using Briscoe scale and rotavirus positivity, and between Standard of sanitation using Briscoe and severity using VesikariClinical Severity score.

Materials & Methods

A co- relation survey was conducted in a tertiary care center over a period of 3 years in 450 children less than 5 years of age diagnosed with acute gastroenteritis (> 3 unformed stools in last 24 hours) and requiring in-patient treatment. Children hospitalized for more than 48 hours and those with primary diagnosis other than acute gastroenteritis were excluded. The nature and purpose of the study were explained and informed written consent was obtained from their parents in their understandable language. Those fulfilling the selection criteria and willing to participate were assessed for Standards of sanitation, Severity of diarrhea and Rotavirus positivity. Standards of sanitation were scored using Briscoe scale, Vesikari Clinical Severity Scoring System was used for diarrhoeal severity and PCR test was used for rotavirus positivity respectively. 445 children were included and analyzed using appropriate statistical test.
Briscoe scale is a measure of standard of sanitation which interviews the mother regarding sanitary practices followed in the family. Maximum score to be achieved was 21, which was grouped as 7-12 : Poor, 13-17 : Fair and 18-21 : Good.[3]

Behaviour		Points		
		3	2	1
Water	Drinking	tube well/tap	ring well	Pond
	Washing	tube well/tap	ring well	Pond
	Bathing	tube well/tap	ring well	Pond
Defecation Children < 5years		Latrine/ Disposed off	Open within compound	Anywhere
Hand		Yes	occasional	No
Hand washing by mother after defecation		Yes with Soap	Yes with Sand or ash	Yes with Water
Appearance of mothers hands		Clean	One clean	Unclean
Drinking water storage		Direct use	clean, covered	Unclean, uncovered
Water for washing		Direct use	clean, covered	Unclean, uncovered

Vesikari severity scale is currently considered the best measurement tool for identifying the endpoint (i.e., severe rotavirus gastroenteritis) in rotavirus vaccine trials. The Vesikari Clinical Severity Scoring System was used in combination with laboratory assays like PCR test in identifying the primary endpoint in rotavirus vaccine efficacy trials, severe rotavirus gastroenteritis. There are seven scoring parameters included in the Vesikari Clinical Severity Scoring System. These parameters take into account each of the symptoms identified as important in the clinical present at ion profile: diarrhea, vomiting, fever, dehydration, and the duration of diarrhea and vomiting. An additional parameter considered is treatment status. Each of the seven parameters is broken into thirds according to an equally divided severity distribution (i.e., bottom third=1, middle third=2, top third=3) as initially identified by Ruuska and Vesikari (1990). The scores for each parameter within the clinical severity scoring system are added allowing for a severity score between 0 and 20 points. Severity scores above 10 points (i.e., ≥11 points) are considered severe, scores between 7 and 10moderate, and scores less than 7 mild.[4]

Results

Statistical analysis was done using SPSS version 20.00 (IBM). Level of significance was set at 5%.Variables were checked for normal distribution using histogram. Pearson's test for co-relation was applied, co-efficient *r* was determined and *p* value was noted. A negative linear co-relation was found between standards of sanitation and rotavirus positivity(*r*=0.-481); indicating that higher score on Briscoe scale shows lower rotavirus positivity and vice versa. Similarly, a negative linear co-relation was found between standards of sanitation and severity (*r*=-0.65); indicating less severity in those with higher levels of sanitation. Demographics such as age, gender and area distribution are shown in table 1-2. Distribution according to Briscoe standard of sanitation and Vesikari score are shown in table 3 and 4.

Table 1: Age Wise Distribution

	Acute Gastroenteritis		Rotavirus Positive Cases	
Age	Number	Percentage	Number	Percentage
< 6 months	82	18.42%	9	10.11%
6-12 months	119	26.74%	58	65.16%
12-36 months	190	42.69%	17	19.10%
36-60 months	54	12.13%	5	5.61%
Total	445		89	

Table 2. Area Wise Distribution

	Acute Gastroenteritis Cases		Rotavirus Positive Cases	
Area	Number	Percentage	Number	Percentage
Rural	181	40.67%	20	22.47%
Urban	55	12.35%	18	20.22%
Urban slum	209	46.96%	51	57.30%
Total	445		89	

Table 3: Distribution According to Vesicare Score Severity

	Acute Gastroenteritis Cases		Rotavirus Positive Cases	
Severity	Number	Percentage	Number	Percentage
Mild	2	0.44%	-	-
Moderate	97	21.79%	18	20.22%
Severe	324	72.80%	69	77.52%
Very severe	22	49.43%	2	2.24%
Total	445		89	

Table 4 : Distribution According to Briscoe Scale Severity For Sanitation

	Acute Gastroenteritis Cases		Rotavirus Positive Cases	
Sanitation	Number	Percentage	Number	Percentage
Good	76	17.07%	12	13.48%
Fair	177	39.77%	46	51.68%
Poor	192	43.14%	31	34.83%
Total	445		89	

Discussion

In this study, epidemiological trends such as the standards of sanitation and the severity of rotavirus positivity in children having diarrhea in a tertiary care center of Gujarat, India were determined.As in most countries with temperate climate, rotavirus gastroenteritis presented a clear seasonal pattern. Rotavirus gastroenteritis appears to be consistently more prevalent in winter, with a peak from January through March. Conversely, rotavirus was rarely detected in summer from June to September. Exclusive breast-feeding was found to be significantly associated with a lower incidence of rotavirus gastroenteritis. The low incidence might be due

to the anti infective properties of breast-milk. Promotion of breast-feeding would augment the impact of rotavirus vaccines in preventing severe childhood diarrhea.

According to the results of previous studies, the association between rotavirus and severe diarrhea is conflicting. In a hospital-based study in Bangladesh it was reported that children infected with rotavirus had less severe dehydration than those infected with other enteropathogens. Rotavirus was also found not to be associated with severe dehydration in several case-control studies. Conversely, some studies reported that rotavirus diarrhea was particularly severe compared with infections by other enteropathogens. In these studies, the authors usually relied on hospitalizations as an indicator of severe rotavirus gastroenteritis. Since admission to a hospital may be influenced by socio-economic factors and/or by the doctor's attitude, we decided to score each gastroenteritis episode using a clinical scoring system.

Our study also found a significant co-relation between sanitation and rotavirus positivity. A review of studies performed in India during 1990–2005 had estimated that rotavirus disease accounted for 20.8% of all diarrhea-related hospital admissions. [5]Much in line with this, our study found rotavirus positivity in 20% cases.

Approximately 113 000 children (99% CI: 86 000–155 000) younger than five years died from rotavirus infection in India in 2005, for a mortality rate of 4.14 (99% CI: 3.14–5.68) deaths per 1000 live births. This suggests that roughly 1 child in 242 will die from rotavirus infection by the age of 5 years. The first year of life was the period of highest risk for death due to rotavirus infection, a finding that underscores the need for on-time vaccination.[6] In our study, 42.69% were affected between 12-36 months of age, followed by 26.74% among 6-12 months, 18042 in <6 months and the least among 36-30 months with 12.13%. This is also quite similar to Kang G et al who conducted a multi-centric study on epidemiology of rotavirus disease and strains in children less than 5 years of age. [7]Rotavirus detection rates were greatest among children aged 6–23 months, and 13.3% of rotavirus infections involved children aged <6 months.

Compared with results from studies published from1986 to 1999, the proportion of diarrhea hospitalization attributable to rotavirus appears to have increased between2000 and 2004. This phenomenon likely reflects a relatively slower rate of decrease in hospitalizations for rotavirus compared with other causes of severe childhood diarrhea. This finding could be accounted for by several factors. First, interventions to improve hygiene and sanitation are likely to have a greater impact on diarrhea caused by bacterial and parasitic agents, which are transmitted primarily through contaminated food or water, unlike rotavirus, which is often spread from person-to-person.[8]In our study also, significant co-relation was found between sanitation and rotavirus positivity (r=0.-481) suggesting the increased standards of sanitation resulting into lesser rotavirus positivity.

Conclusion

Higher levels of sanitation co-relates with less rotavirus positivity and severity of gastroenteritis, emphasizing the importance of appropriate sanitation in children among a tertiary care center in Gujarat, India.

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