ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(8): 56-60
www.allresearchjournal.com
Received: 15-06-2016
Accepted: 17-07-2016

Jagdish Prasad Sahoo
Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India

Rajesh Kumar Lenka
Department of Microbiology, IMS and SUM Hospital, Siksha "O" Anusandhan University (Deemed to be), K8, Kalinga Nagar, Bhubaneswar, Odisha, India

Correspondence
Rajesh Kumar Lenka
Department of Microbiology, IMS and SUM Hospital, Siksha "O" Anusandhan University (Deemed to be), K8, Kalinga Nagar, Bhubaneswar, Odisha, India

Clinical and etiological analysis of acute diarrhoea from children under five year age from a tertiary care teaching hospital, Bhubaneswar

Jagdish Prasad Sahoo and Rajesh Kumar Lenka

Abstract
Diarrhea is a leading cause of morbidity and mortality for children, although sparse data is available on the etiology of diarrhea in India. This study was conducted to determine main causes that underlie childhood diarrhea and related diseases. All children presenting with acute diarrhoea in the age group of below 5 years of age admitted in paediatric ward. In this study 6mnth to 1 year age group children were highly affected (47%) with no sex predilection. Among the common organisms isolated 55% were *E. coli*, 4.7% were *K. pneumonia*, 2%were enterococcus species, 1.4% were *Shigella flexneri* species. Association of fever presented in 100% of cases of of *Shigella flexneri*, 66.7% of enterococcus species presented with fever, 65.9% of *E. coli* followed by 57.1% of *K. pneumoniae* followed by commensals. This association of serum sodium and severity was significant. Uremia and metabolic acidosis were other common findings in our study. Cotrimoxazole showed highest resistance among all organisms.100%with *Shigella flexneri*, *E. coli* 63.4%, 57.14% *K. pneumonia*. This study will help us in better understanding of diarrheal disease. Emphasis should be given to behavioral factors, such as improved access to sanitation, promotion of young child feeding practices, hygienic practices, and implementation of vaccines against etiologic agents, which are the burden of disease severity and also malnutrition as a whole.

Keywords: Acute diarrhea, *Shigella flexneri*, cotrimoxazole, *E. coli*

Introduction
Diarrhea is defined by World Health Organization (WHO) as having 3 or more loose or liquid stools per day or as having more stools than is normal for that person [1] Acute diarrhea, defined as an increased frequency of defecation (three or more times per day or at least 200 g of stool per day) lasting less than 14 days, may be accompanied by nausea, vomiting, abdominal cramping, clinically significant systemic symptoms, or malnutrition [2]. In 2009 diarrhea was estimated to have caused 1.5 million deaths in children under the age of 5 years [3]. Though precise data on childhood mortality associated with diarrheal diseases in eastern India is not available, it has been estimated that approximately 25% of child death are associated with diarrheal diseases, particularly acute diarrhea [4]. In developing countries 50-60% cases are of bacterial (Enteropathogenic *Esherichia coli* 25%, Campylobacter jejuni 10-18%, Salmonella spp. and *Shigella* spp. 5% each), 35% of viral (15-25% rotavirus) origin, and in many the cause is unidentified or mixed [5-9]. So here in this study we revealed about the etiological and clinical data found in our tertiary care teaching hospital. That may enable the researcher to get the proper antibiotic and its associated details to get rid out of it.

Methodology
A prospective study was done in a tertiary care hospital during the period of June 2015 to May 2016 in IMS and SUM hospital, Bhubaneswar. All paediatric cases in the age group of below 5 years were included. A total number of 149 patients were included in the study. Inclusion Criteria was all children presenting with acute diarrhoea in the age group of below 5 years of age admitted in paediatric ward.

Exclusion criteria were neonates, children who are critically ill, persistent diarrhoea more than 14 days, mal absorbtion syndrome, diarrhoea due to metal poisoning (Cadmium, Arsenic, copper, mercury, etc.). After selection, a complete history was obtained from parents, a through general examination and systemic examination was done and finding were recorded in a specially designed proforma. Those patients who had not given consent were excluded. Data analysis was done with use of SPSS and EXCEL Graphs and tables were prepared by MSEXCEL. A p value <0.05 was considered significant. Chi square test was used to establish statistical association between the different parameters.
Differences in proportions were assessed by Chi-square test. P values <0.05 were considered statistically significant.

Result

The mean age group was 1.2 ± 0.94 years with no gender preponderance; most common age group being 6 months to 1 year. The most common clinical presentation was fever (53.7%) followed by vomiting in 33.6% (n=50), blood in stools in 14.1% (n=21), increased frequency of stools, 25.5% (n=38) with <5 episodes, Children with minimal dehydration was 65 cases (43.6%), mild to moderate dehydration 60 cases (40.3%), severe dehydration 24 cases (16.1%). It was found that all AGE, patients had hyponatremia with minimum to maximum value being 118-134 and mean of 128.9.In our study it was found that 125 cases 83.9% patients showed high urea and rest 24 cases (16.1%) showed with normal urea levels. Serum creatinine value was high in 24 cases 16.1%.

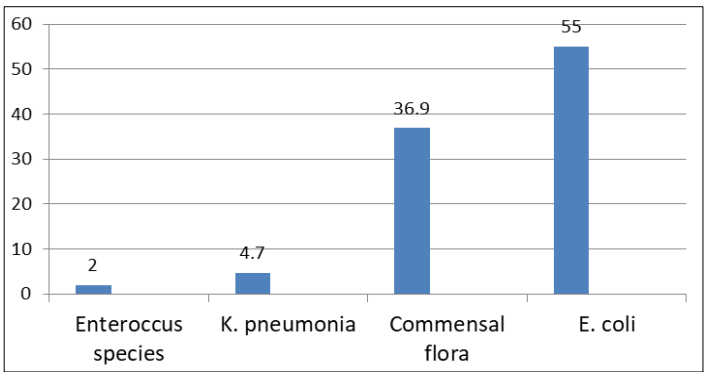

Fig 1: Percentage of bacterial species found in our study

Mean sodium of 123was found with severe dehydration with SD 3.255, in AGE with some dehydration mean sodium was 127.77 with SD 2.860 and in AGE with no dehydration mean sodium was 130.28 and SD 2.058. This association of serum sodium and severity was significant. Uremia and metabolic acidosis were other common findings in our study. In this study, *E. coli* was the most common organism isolated (Figure no 1). It was seen that different bacterial species showed resistant to different drugs whereas majority of them were resistant to Cotrimaxazole, [*E. coli* 52 cases (63.4%), 4 cases (57.14%) in *K. pneumonia*, 2 cases (100%) with *Shigella flexneri*] high urea and rest 24 cases (16.1%) showed with normal urea levels. Serum creatinine value was high in 24 cases 16.1%. It was observed that out of all 50% of *S. flexneri* suffered from severe dehydration, 28.6% of all *K. pneumonia* were severely dehydrated followed by 23.2% of all *E. coli*. [p value <0.0001(very highly significant)] (Table No 1).

Table 1: Microorganism associated in dehydration.

Microorganism	Diagnosis			Total (%)
	AGE with no Dehydration	AGE with some Dehydration	AGE with severe Dehydration	
Commensal flora	39(70.9)	14(25.5)	2(3.6)	55(100.0)
E. coli	24(29.3)	39(47.6)	19(23.2)	82(100.0)
Enterococcus Species	1(33.3)	2(66.7)	0.00	3(100.0)
K. pneumoniae	1(14.3)	4(57.4)	2(28.6)	7(100.0)
S. flexneri	0.(0.0)	1(50.0)	1(50.0)	2(100.0)
total	65(43.6)	60(40.3)	24(16.1)	149(100.0)

Chi sq= 31.613 df = 8 *p*<0.0001 (Very Highly Significant)

Association of fever presented in 100% of cases of *Shigella flexneri*, 66.7% of enterococcus species presented with fever,65.9% of *E. coli* followed by 57.1% of *K. pneumonia* followed by commensals [p value <0.002(highly significant)]. Among bottle feeding infants 57.5% suffered from AGE with some dehydration, 27.5% AGE with severe dehydration (Table No 2). In Class V SES 44.4%suffered from severe dehydration, class IV 21.4% suffered from severe dehydration. In grade IV malnutrition 57.1% suffered from some dehydration and 42.9% suffered from severe dehydration (Table No 3).

Table 2: Diagnosis of Bottlefed infant AGE with severe dehydration

Bottlefed	Diagnosis			Total (%)
	AGE with no Dehydration	AGE with some Dehydration	AGE with severe Dehydration	
Yes	6(15.0%)	23(57.5%)	11(27.5%)	40(100.0%)
NO	42(54.4%)	27(35.1%)	8(10.4%)	77(100.0%)
NA	17(53.1%)	10(31.3%)	5(15.6%)	32(100.0%)
Total	65(43.6%)	60(40.3%)	24(16.1%)	149(100.0%)

Chi sq =19.184 df = 4 p = 001 (Highly Significant)

Table 3: Dehydration rate with nutritional status in effected children.

Nutrition Status	Diagnosis			Total (%)
	AGE with no Dehydration	AGE with some Dehydration	AGE with severe Dehydration	
Grade I	9(52.9)	8(47.1)	0(0.0)	17(100.0)
Grade II	2(7.1)	14(50.0)	12(42.9)	28(100.0)
Grade III	4(25.0)	8(50.0)	4(25.0)	16(100.0)
Grade IV	0(0.0)	4(57.1)	3(42.9)	7(100.0)
NORMAL	50(61.7)	20(32.1)	5(6.2)	81(100.0)
Total	65(43.6)	60(40.3)	24(16.1)	149(100.0)

Chi sq = 46.394 df = 8 $p<0.0001$ (Very Highly Significant)

Discussion

It is widely recognized that diarrhea is a major cause of morbidity and mortality among children, especially children in developing countries. Low socio-economic status, poor environmental sanitation and low hygienic practices pose a serious threat to people's health, especially children's health. Risk factors for diarrhea vary with the child's age, the pathogens involved, and the local environment. We observed that cases were mostly children less than 12 months of age, 16(10.7%) cases less than 6 months of age excluding the neonates, in 6 months- 1 year of age 70 cases (47%) making total of 57.7%.

According to Molbak K *et al.* [11] and Woldemicael G [12], the rates of diarrhea were highest for children 6-11 months of age, remained at a high level among the 1-5 year old children and decreased when children got older. The high incidence of diarrheal disease in Khanduja *et al.* [13] and Sood S [14] suggested that the high incidence of diarrheal disease in the first 2 years of life is probably related to faulty weaning, unhygienic handling and storage of milk and food, higher incidence of parental infection, malnutrition, development of mouthing habits at this age. A decrease in number of cases among older children might be resulted from a fact that the immune system in older children got stronger in resisting against agents.

In our results defining socioeconomic status according to modified kuppuswamy scale, diarrhea in class I 5cases (3.4%), class II 48(32.2%), class III 59(39.6%), class IV 28(18.8%), class V 9 cases (6%). Class V SES 44.4% suffered from severe dehydration, class IV 21.4% suffered from severe dehydration, class III 18.6% suffered from severe dehydration 20% from class I followed by class II 4.2%. 60.7% with class IV suffered from some dehydration, 42.4% class III suffered from some dehydration followed by 31.3% by class II, class V 22.2%, 20% by class I. In our study correlation between severity of diarrhea and lower socioeconomic status was statistically significant. [Chi sq = 24.602, df= 8, p = 0.002 (Highly Significant)]. As per Gerald T. Keusch *et al.* [15], the frequency and severity of diarrhea is aggravated by lack of access to sufficient clean water and sanitary disposal of human waste, inadequate feeding practices and hand washing, poor housing conditions and lack of access to adequate and affordable health care. A literate woman is able to take decisions regarding the severity of disease that her child might be suffering with and is also able to recognize the health care facilities that are available close to her house for her children is responsible for severity of illness in low socioeconomic class.

According to Rasania SK *et al.* [16] studies done in India and abroad have also reported varied prevalence of diarrhea which might be due to difference in study methodology, nature of population, geographic, seasonal variation and socioeconomic condition of the community selected. In Indian slums nearly 100,000 babies die every year before their fifth birthday (NFHS-3 India, 2005-06), as a result of dehydration, weakened immunity or malnutrition associated with diarrhea [17] In present study it was found that 55(36.9%) were commensals, 82(55%) were *E. coli*, 7(4.7%) were *K. pneumonia*, 3(2%) were enterococcus species, 2(1.4%) were *Shigella flexneri* species. This pattern was similar to other studies done in India by workers like Joshi *et al.* [18]. Out of all diarrheal patients 43.6% suffered from no dehydration, 40.3% suffered some dehydration, 16.1% pts had severe dehydration. Study by Haricharan. K *et al.* [19], some dehydration was present in 80% of the cases and 14% had severe dehydration and 6% had no dehydration. Monika pathania *et al.* [20], out of all 67.1% children presented with some dehydration followed by no dehydration (23.5%) and severe dehydration (9.6%). Among all *E. coli* in stool culture 29.3% suffered from no dehydration, 47.6% from some dehydration, 23.2% from severe dehydration. Of all *Shigella* in stool culture 50% presented with some dehydration and 50% with severe dehydration. Of all *K. pneumonia* 57.4% presented with some dehydration and 28.6% presented with severe dehydration, rest with no dehydration. In *Enteroccocus* species 66.7% presented with some dehydration and 33.3% with no dehydration, among the commensals 70.6% with no dehydration. This correlation between organism and severity was statistically significant. P value <0.0001. In study by Monika *et al.* 2014 [20], out of 124 patients of *Escherichia coli* 80 patients (64.5%) presented with some dehydration and rest with no dehydration. History of bottle feeding in infants was enquired it was found that 26.3% were taking bottle feeding 51.3% of infants were not bottle feed. Relation of bottle feeding with severity of diagnosis in infants was found that 6(15%) had suffered from AGE with no dehydration, 23 (57.5%) from AGE with some dehydration, 11 (27.5%) from AGE with severe dehydration. Infants who were not bottle feed 42 (54.4%) had no dehydration, 27 (35.1%) had some dehydration, 8 (10.4%) had severe dehydration. This correlation was statistically significant Chi sq = 19.184, df= 4, p = 001(Highly Significant). Bottle fed (BF) infants face an increased risk of gastroenteritis and diarrhea. Infants who are bottle fed are 2.8 times more likely to develop gastrointestinal [21]. A study by Hussain Z Khan *et al.* [22], diarrhea was more common in BF infants than in exclusively breastfed (EBF) infants as it shows that in BF infants 26% were suffering from diarrhea whereas 24% EBF infants were suffering. In present study it was found that patients with grade 1 malnutriton 9 (52.9%) suffered from no dehydration and 8(47.1%) suffered some dehydration. Patients with grade II malnutrition 14(50%) had some dehydration, 12 (42.9%) had severe dehydration. Among grade III malnutrition 4 (25.0%) suffered from no dehydration, 8 (50.0%) suffered from some dehydration, 4 (25.0%) suffered from severe dehydration. In grade IV

malnutrition none had no dehydration, 4 (57.1%) had some dehydration, 3 (42.9%) had severe dehydration.

This relationship between severity and malnutrition was found to be very highly significant with p value 0.0001 Chi sq = 46.394 df= 8. Farzana *et al.* [23], malnourished children were more likely to present with visible or reported blood in their stool ($P < 0.001$), suffer from some or severe dehydration (P = 0.005), and receive intravenous fluid (P = 0.002) compared with well-nourished children. Among Minimal to severe dehydration children, 35%were malnourished compared with 24% of Minimal dehydration children (P <0.001). Monika Pathania *et al.* [20], fever was found to be a predominant clinical feature present in 89.6% of patients of diarrhea, Vomiting 61.8%, increased frequency of stools 52.5% <5, 38.2% 5-10, 8.2% >10.Fever was predominant symptom (n=80) 53.7% in all diarrheal patients. All100% patients who had diarrhoea due to *Shigella flexneri* suffered. The pattern of antibiotic susceptibility of various bacterial pathogens matches to greater extent to work done by Daniel R., and Diniz-Santos, *et al.* [24].

High resistance to Co-trimoxazole among all pathogens can be attributed to its injudicious use among the population because of its wide antimicrobial spectrum most likely to be used for various infections. *E. coli* isolates were found to have a high rate of resistance to first line Cotrimoxazole, ampicillin and ciprofloxacin, in third genereation cephalosporins ceftazidime and ceftriaxone resistance was seen. This can be explained as *E. coli* being so common agent of diarrhoea, its strains are most mostly exposed to different antibiotics injudiciously. Monika Pathania *et al.* [20] found that *E. coli* isolates were found to have a highrate of resistance to ampicillin, ampicillin + sulbactam and Co-trimoxazole. The knowledge of resistance pattern of common etiological agents in local area can help practitioners to choose an adequate antimicrobial drug to start empirical therapy to prevent the illness.

Conclusion

The occurrence was more in the age group of 6months to 1 year of age. Bottle feeding, Low socioeconomic class and malnutrition were associated with severity of AGE in children. Most common organism isolated was *E. coli* followed by commensals, *K. pneumonia*, *Enterococcus* species, *Shigella fexneri.* Children with acute diarrhea should be monitored for the development of severe dehydration, decreased urine output and electrolyte derangement especially hyponatremia and acid base disturbances. Emphasis should be given to behavioural factors, such as improved access to sanitation, promotion of young child feeding practices, hygienic practices, and implementation of vaccines against etiologic agents, which are the burden of disease severity and also malnutrition as a whole.

Reference

1. World Health Organisation. Diarrhea. Geneva: WHO, 2007.
2. Nathan Thielman M, Richard L. Guerrant. Acute Infectious Diarrhea. N Engl J Med. 2004; 350:38-47.
3. World health organization. Diarrheal Diseases. Geneva: WHO, 2009.
4. Maharjan R, Lekhak B, Shrestha CD, Shrestha J. Detection of Enteric Bacterial Pathogens (*V. cholerae* and *E. coli* O:157) in childhood diarrheal cases. Scientific World. 2007; 5(5):23-26.
5. Cheng AC, Mc Donald JR, Thielman NM. Infectious diarrhea in developed and developing countries. J Clin Gastroenternol. 2005; 39(9):757-73.
6. Elliott EJ. Acute Gastroenteritis in children. BMJ. 2007; 334:35-40.
7. Wilson ME. Diarrhea in Nontravellers: Risk and Etiology. CID. 2005; 41:541-6.
8. Cunliffe NA, Kilgore PE, Breasee JS, Steele AD, Luo N, Hart CA, Glass RI. Epidemiology of rotavirus diarrhea in Africa: a review to assess the need for rotavirus immunization. Bull World Health Organ. 1998; 76(5):525-37.
9. Naghipour M, Nakgomi T, Nakagomi O. Issues with reducing the rotavirus associated mortality by vaccination in developing countries. Vaccine. 2008; 26:3236-41.
10. Gallas NA, Olfa B, Bouratbeen A, Hassen AB, Aissa RB. Etiology of Acute Diarrhea in Children and Adults in Tunis, Tunisia, with Emphasis on Diarrheagenic *E. coli*: Prevalence, phenotyping and molecular epidemiology. Am J Trop Med Hyg. 2007; 77:571-82.
11. Molbak K. The epidemiology of diarrheal diseases in early childhood: Areview of community studies in Guinea-Bissau. University of Copenhaghen, 2000.
12. Woldemicael G. Diarrheal morbidity among children in Eritrea: environmental and socioeconomic determinants. J Health Popul Nutr. 2001; 19(2):83-90.
13. Khanduja PC, Bhargava SK. Etiological aspects of diarrhoea in infants and children under 5yrs. Indian J pediatrics. 1969; 36:237.
14. Sood S. Etiology of diarrhoea in infancy. Indian J Ch. Hlth. 1963; 12:727.
15. Gerald T, Keusch OF, Alok B. Disease Control Priorities in Developing Countries, 2001, 371-388.
16. Rasania SK, Singh D, Pathi S, Singh S. Knowledge and Attitude of mothers about ORS in few urban slum of Delhi. Health and Population -Perspectives and issues. 2005; 28(2):100-107.
17. Diarrhoea. Why children are still dying and what can be done' UNICEF/ WHO joint report on preventing and treating the second leading killer of children, http://www.unicef.org/health/index_51412.h tml).
18. Joshi CK, Bharadwaj AK, Vyas BL. Study of bacterial infantile diarrhoea. Indian J Pediat. 1980; 47:307-310.
19. Haricharan K, Shrinivasa BM, Vatsala Kumari. Clinical and bacteriological Study of Acute Diarrhoea in Children, Journal of Evolution of Medical and Dental Sciences/ Volume 2/ Issue 23/June 10, 2013, 4231.
20. Monika Pathania *et al.*, Clinical Study of Acute Childhood Diarrhea Causedby Bacterial Enteropathogens journal of clinical and diagonostic research, 2015, 8(5).
21. World Health organisation. Indicators for assessing infant and young child feeding practices. WHO Press Washington D.C.WHO Publications, 1991.
22. Hussain Z, Khan N. Assessment of the Nutritional Status of Bottle-Fed Infants and the Prevalence of Infections, Allergy and Diarrhea among Bottle Fed Infants and Its Comparison with Exclusively Breast Fed Infants Aged 0-6 Months. J Pediatr Neonatal Care. 2017; 6(4):00249.
23. Farzanaferdous Severity of Diarrhea and Malnutrition among Under Five-Year-Old Children in Rural Bangladesh the American Society of Tropical Medicine and Hygiene, 2013.

24. Daniel R, Diniz-Santos *et al*. Epidemiological and microbiological aspects of acute bacterial diarrhoea in children from Salvador, Bahia, Brazil. Braz J Infect Dis Salvador. 2005, 9(1).