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Original Research Article

Clinical profile of children with diarrhoea admitted in pediatric intensive care unit of Bal Chikitsalay, M.B. Hospital, RNT Medical College, Udaipur, Rajasthan, India

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ABSTRACT

Background: In India, diarrhoea is the third most important cause of under-five mortality after pneumonia and complications of prematurity. According to a study, 22% of rotavirus associated deaths worldwide were from India. Two most important consequences of diarrhoea in children are malnutrition and dehydration. Malnutrition and diarrhoea form a vicious cycle, as malnutrition increases risk and severity of diarrhoea. Impaired absorption, loss of nutrients, increased catabolism and improper feeding aggravate severity of malnutrition. Significant dehydration with abnormal electrolytes and acid base status occurs, which may be fatal. The study was done to know prevalence of malnutrition and diarrhoea along with various acid base disorders associated with it.
Methods: Children of age group 1 month to 60 months of age were enrolled in the study. Relevant investigations were carried out and recorded.
Results: A total of 164 children were enrolled, out of which 86 were males and 78 females. Maximum numbers of children were infants. Rotavirus alone was responsible for 42% of children with severe dehydration. Nutritional status of children with diarrhoea showed high prevalence of malnutrition in children with severe dehydration, as one third of children had mid upper arm circumference less than 11.5cm. Most common complication was uremia.
Conclusions: Rotavirus diarrhoea was a major cause of severe dehydration in children. Malnutrition was associated in majority of children.

Keywords: Acidosis, Diarrhoea, Electrolytes, Malnutrition, PICU

INTRODUCTION

Diarrhoea is defined as change in consistency and frequency of stools. Global annual burden of diarrhoea is huge, affecting 3-5 billion cases and causing approximately 2 million deaths a year. In India, diarrhoea is the third most important cause of under-five mortality (11%) after pneumonia (24%) and complications of prematurity (18%).[1] According to a Lancet review study, 22% of rotavirus associated deaths worldwide were from India.[9] Two most important consequences of diarrhoea in children are malnutrition and dehydration. Malnutrition and diarrhoea form a vicious cycle, as malnutrition increases risk and severity of diarrhoea. Impaired absorption, loss of nutrients, increased catabolism and improper feeding aggravate severity of malnutrition. Significant dehydration with abnormal electrolytes and acid base status occurs, which may be fatal. The study was done to know prevalence of malnutrition and diarrhoea along with various acid base disorders associated with it. The aim of the study was to study clinical profile, nutritional status and complications of

under five year age children with diarrhoea admitted in PICU of Bal Chikitsalaya, MB Hospital, RNT medical college, Udaipur, Rajasthan, India.

METHODS

This was a single centre, hospital based prospective study. All children of age group 1 month to 60 months of age, admitted in PICU of Bal Chikitsalaya, MB Hospital with diarrhoea dehydration from 1st January 2014 to 31st December 2014 were enrolled in the study. To reduce the sample size, all children who were admitted on Monday and Thursday of every week were selected for the study.

Blood glucose was recorded on admission. The routine blood samples including complete blood counts, urea, creatinine and electrolytes were collected at admission before starting fluid therapy and sent to central laboratory of MB Hospital. Anthropometry including height, weight and mid arm circumference was recorded. Blood gas analysis was performed using GEM PREMIER 3000, which has been installed in PICU, thus minimizing delay in analyzing samples and associated errors. Testing for rotavirus was done using rotaviral antigen enzyme immunoassay kit (SD BIOLINE KIT). All data was recorded and analyzed using SPSS version 17.

Children with other systemic diseases like congenital heart disease, pneumonia, bronchiolitis, congenital adrenal hyperplasia, septicemia and MODS, metabolic disorders, hemoglobinopathies, liver disease, Reye's syndrome, malabsorbtion syndromes, celiac disease, children on antiepileptic, diuretics, immunosuressive drugs and corticosteroids were excluded.

RESULTS

A total of 164 children were admitted in PICU, out of which 86 were males and 78 females (M:F = 1.1:1). There were 31 children in age group 1-6 months, 48 in age group 6 to 11 months, 47 in age group 12-23 months, 16 in age group 24-35months, 14 in age group 36 to 47 months and 8 in age group 48 to 60 months (Figure 1).

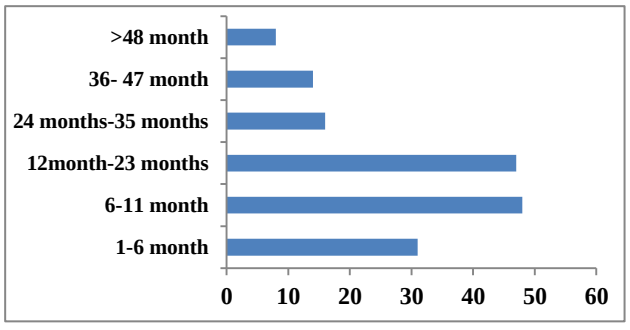

Figure 1: Age distribution of children admitted in PICU with diarrhoea/dehydration.

Total of 69 (42.07%) of children were positive for rotavirus infection, most of which were infants (n = 40, 50.63%), 42.55% in age group 1-2 year, 25% in age group 2-3 year, 21.42% in age group 3-4 year and another 25% in age group 4-5 year. Average duration of stay in PICU was 46.5 hours. Variation of incidence of diarrhoea distributed over year showed two peaks. One during March and second peak during June, July and August (Figure 2).

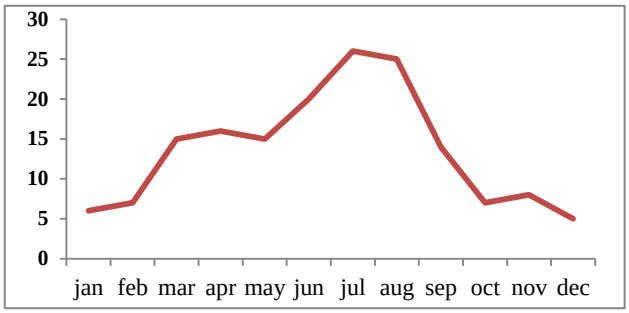

Figure 2: Seasonal variation in incidence of diarrhoea.

Nutritional status of children with diarrhoea showed high prevalence of malnutrition in children with severe dehydration. 32.31% of children had mid-upper arm circumference less than 11.5 cm, 40.8% between 11.5 to 12.5 cm, and 26.8% of children had mid upper arm circumference more than 12.5 cm. According to IAP classification (weight for age percentage) of malnutrition, 15.85% children had Grade IV PEM, 12.8% had grade III, 34.15% had grade II malnutrition while 23.78% of children had grade I malnutrition (Table 1).

According to WHO classification of malnutrition, weight for height and height for age was used to classify children as wasted (weight for height between 2 to 3 standard deviation below mean) and severe wasting (weight for height less than 3 SD below mean). Similarly, child was labeled stunted if height for age was between 2 to 3 SD below mean and severe stunted when height for age was less than 3 SD below mean. 50.68% of children had wasting while 31.51% had severe wasting. 24.39% of children were found to be stunted and 18.90% to be severely stunted (Table 1 and 2).

Table 1: Mid upper arm circumference and IAP grading of malnutrition.

MAC	No. of children	Percentage
<11.5	53	32.31
11.5-12.5 cm	67	40.85
12.5-13.5cm	29	17.68
>13.5cm	15	9.15
IAP Grade	**No. of children**	**%**
0	22	13.41
1	39	23.78
2	56	34.15
3	21	12.80
4	26	15.85
Total	**164**	

Table 2: WHO classification of malnutrition (weight for height and height for age of children).

WHO classification		
No wasting	26	17.80%
Wasting	74	50.68%
Severe wasting	46	31.51%
Total	**146**	
No stunting	93	56.70%
Stunting	40	24.39%
Severe stunting	31	18.90%
Total	**164**	

Table 3: Hemoglobin concentration of study population.

Hb (gm/dL)	No. of children	Percentage
<5	5	3.05
5 to 7	9	5.48
7 to 9	56	34.14
9 to 11	66	40.24
>11	28	17.07

Table 4: Complications of children with diarrhoea.

Complications		No. of children	Percentage
Acidosis	pH		
	<7.10	39	23.78
	7.10-7.20	48	29.27
	7.20-7.35	68	41.46
	7.35-7.45	9	5.48
	>7.45	0	0
Electrolytes			
Na^+			
	<135	61	37.19
	135-145	63	38.41
	>145	40	24.39
K^+			
	<3.5	73	44.51
	3.5-5	44	26.83
	>5	47	28.65
Blood Urea	(mg/dl)		
	<40	28	17.07
	>40	136	82.92
Blood sugar level			
	<60	44	26.83
	>60	120	73.17

Complications in children with diarrhoea dehydration included severe acidosis (pH <7.1 in 23.78%, 7.10 to 7.20 in 29.27%, 7.20 to 7.35 in 41.46%), hyponatremia (37.19%), hypernatremia (24.39%), hypokalemia (44.51%), hyperkalemia (28.65%), hypoglycemia (26.83%) and uremia in 82.925 of children (Table 4). 72.72% children (n = 32) with hypoglycemia were infants, while 27(61.36%) children with hypoglycemia had weight for height less than 3 SD below mean. 68.85% of children with hyponatremia and 87.5% children with hypernatremia were less than 12 months of age. Abnormalities in potassium were also more common in infants with 68.85% of hypokalemic and 57.5% of hyperkalemic children were infants.

Similar trend was seen with acidosis and 71.26% (62 out of 87) children with severe acidosis pH <7.20 were infants. Thus, infants had higher prevalence of electrolyte abnormalities than other age group. Anemia was also a common occurrence in study group. Incidence of severe anemia with hemoglobin less than 5 gm% was 3.05%, Hb between 5 to 7 gm% was 5.48%, 34.14% of children had Hb of 7 to 9 gm %, 40.24% of children had Hb of 9 to 11 gm%, and only 17.07% of children had Hb more than 11 gm% (Table 3).

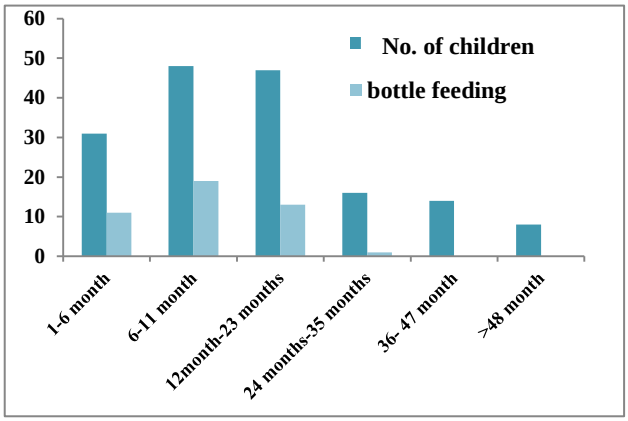

Figure 3: Bottle feeding practice in children with diarrhoea.

Study of feeding practice of children with diarrhoea showed that 37.97% of infants were bottle fed, while 27.66% of children of age group 1-2 year were bottle fed.

DISCUSSION

Most of children admitted with diarrhoea with dehydration were infants, accounting for 48.16%, and another 28.65% of 1-2 year of age. This was similar to study conducted by Haricharan et al, where 87% of children were below 2 years of age. 42.07% of children were tested rotavirus positive, and most (50.63%) of them were infants. The prevalence of rotavirus infection varies in different studies due to climate, social and demographic factors.[2-7] There is difference in age group of children affected by rotavirus infection. While our study had maximum number of infants tested rotavirus positive, data from developed countries had higher age of children affected with rotavirus diarrhea.[8] This variation may be due to vaccination of children, economic variations and feeding practices.[9] Practice of bottle feeding was found to be prevalent in around 37.97% of infants. Gunn et al had shown relationship of cholera and

bottle feeding in infants and Duffy et al between bottle feeding and rotavirus diarrhoea.[10,11]

Incidence of severe malnutrition (III and IV) complicating diarrhoea in our study according to IAP grading was 28.65%. Complications of diarrhoea included severe acidosis (pH <7.1 in 23.78%, 7.10 to 7.20 in 29.27%, 7.20 to 7.35 in 41.46%), hyponatremia (37.19%), hypernatremia (24.39%), hypokalemia (44.51%), hyperkalemia (28.65%) hypoglycemia (26.83%) and uremia in 82.925 of children. The complications on admission in similar study by Daral et al had incidence of severe acidosis (60.5%), elevated blood urea (37.1%), hypoglycemia (13.6%), hyponatremia (12.3%), hypokalemia (9.9%), hypernatremia (8.6%), etc. Reid et al found prevalence of hypoglycemia to be 9.2%. Only children admitted in PICU were enrolled and thus higher incidence of complications.

Limitations of the study were that only children requiring ICU admission were studied. A better study would have been enrolling all children presenting with diarrhoea and comparing number of children requiring PICU admission. Since this was only descriptive study, hence no significant conclusion could be drawn. Testing for other pathogens responsible for diarrhoea was not done because of financial constraints.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Jagadishan B, Yachha SK. Disease of Gastrintestinal system and liver. Ghai Essential Pediatrics, 8th edition. Srivastava A, Paul VK, Bagga A. CBS Publishers and distributors. India;2013:291.
2. Haricharan K, Srinivasa BM, Kumari V. Clinical and bacteriological study of diarrhoea in children. J Evolution Med Dental Sci. 2013;2(23):4229-37.
3. Bhat P, Macaden R, Unnykrishnnan P, Rao HG. Rotavirus and bacterial enteropathogens in acute diarrhoea of young children in Bangalore. Ind J Med Res. 1985;82:105-9.
4. Sen D, Saha MR, Nair B, Das P, Niyogi S, Bhattacharya SK, et al. Etiological spectrum of acute diarrhoea in hospitalized patients in Calcutta. Ind J Med Res. 1985;82:286-91.
5. Singh PB, Sreenivasan MA, Pavri KM. Viruses in acute gastroenteritis in children in Pune, India. Epidem Infect. 1989;102:345-53.
6. Dutta SR, Khalfan SA, Baig BH, Philipose L, Fulay Fil R. Epidemiology of rotavirus diarrhoea in children under five years in Bahrain. Int J Epidemiol. 1990;19:722-7.
7. Phukan AC, Patgiri DK, Mahanta J. Rotavirus associated acute diarrhoea in hospitalized children in Dibrugarh, north-east India. Indian J Pathol Microbiol. 2003;46:274-8.
8. Nakagomi O, Takahashi Y, Enoki M, Suzuki T, Kilgore PE. Incidence and Burden of Rotavirus Gastroenteritis in Japan, as Estimated from a Prospective Sentinel Hospital Study. J Infect Dis. 2005;192(1):106-10.
9. Tate JE, Burton AH. Estimate of worldwide rotavirus associated mortality in children younger than 5 years before introduction of universal rotavirus vaccination programmes: a systematic review and meta-analysis. Lancet Infect Dis. 2008;12(2):136-41.
10. Gunn RA, Kimball AM, Pollard RA, Feeley JC. Bottle feeding as risk factor for cholera in infants. Lancet. 1979;6:730-2.
11. Duffy LC, Byers TE, Talty MR. The effect of infant feeding on rotavirus induced gastroenteritis: a prospective study. Am J Public Health. 1986;76(3):259-63.
12. Daral TS, Singh HP, Sachdev HP, Mohan M, Mathur M, Bhargava SK. Acute dehydrating diarrhoea: clinical profile in neonates and young infants. Ind Ped. 1985;22(5):333-8.
13. Reid SR, Losek JD. Hypoglecemia complicating dehydration in children with acute gastroenteritis. J Em Med. 2005;29(2):141-5.

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