



A STUDY OF BIOCHEMICAL ABNORMALITIES AND RENAL INVOLVEMENT IN ACUTE DIARRHOEA IN CHILDREN AGED LESS THAN 5 YEARS

Paediatrics

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ABSTRACT

Introduction: Acute diarrhoeal disease is a major public health problem and a leading cause of paediatric morbidity and mortality¹. Globally there are nearly 1.7 billion cases of childhood diarrheal disease every year and is a leading cause of malnutrition in children under 5 years old. In Indian health institutions, up to a third of paediatric admissions are due to diarrhoeal diseases and up to 17% of all deaths in indoor paediatric patients are due to diarrhoea. **Aim And Objective:** This study was done to detect the electrolyte imbalance and renal involvement in acute diarrhea. **Materials And Methods:** A hospital based prospective study which was conducted from February 2021 to December 2022 with 151 children in the age group of 1 months to 5 years admitted to paediatric ward with history of diarrhoea, significant dehydration, weight loss at AL AMEEN MEDICAL COLLEGE AND HOSPITAL. **Result:** Infants are affected more (44.4%) with more male children suffering from diarrhoea are 53% than females 47%. 39% with some sign of dehydration vs 61% of no signs of dehydration, 53% of the children were having higher creatinine levels i.e into AKI. 36% are hyponatremic, 26.4% are hypochloremic, 17.2% are hypokalemic, 9.2% are hyperchloremic and 7.9% are hypernatremic. In this study most of the patients are hyponatremic>hypochloremic>hypokalemic >hyperchloremic>hypernatremic. **Conclusion:** There is huge impact of diarrhoea on biochemical abnormalities especially hyponatremia, hypochloremia and hypokalemia. Early treatment with ORS and antimotility drugs has been associated with improvement in the children, to prevent morbidity and mortality.

KEYWORDS

Acute diarrhoea, hyponatremia, hypochloremia, hyperchloremia, hypernatremia, hypokalemia, AKI

INTRODUCTION

Acute diarrhoeal disease is a major public health problem and a leading cause of paediatric morbidity and mortality. In Indian health institutions, up to one third of paediatric admissions are due to diarrhoeal diseases and up to 17% of all deaths in indoor paediatric patients are due to diarrhoea¹. The latest report of United Nations International Children's Emergency Fund (UNICEF) revealed that deaths among under five children are mostly are caused by malnourishment (45%), Pneumonia (15%) diarrhoea (8%), malaria (5%) and others (9%). About 2.2 million children died in 2002 from dehydration brought on by diarrhoea, which equates to 42,000 each week, 6000 per day, 4 every minute, and one every 14 seconds.²

The main cause of death in acute diarrhoea is dehydration which results from the loss of fluids and electrolytes in stool. The clinical manifestations of acute diarrhoea are related to the severity of water deficit and the type of electrolyte disturbances. Oral Rehydration Therapy with glucose-electrolyte solution has saved the lives of millions of children since it was first introduced in 1980s and is still the go-to treatment for acute watery diarrhoea. However, replenishing the loss orally in cases of large volume watery diarrhoea like cholera remains a significant issue for healthcare professionals³. Although the use of oral rehydration therapy has significantly decreased both morbidity and mortality in cases of diarrhoea, rehydration has little effect on stool volume or frequency, and since ORS per se cannot be the ultimate management of diarrhoea, the World Health Organization has recommended the drug treatment be added as long as the drug used has proven safety and efficacy in paediatric population.

Dehydrating diarrhoea may act as a precipitating factor for the development of AKI by causing hypoperfusion kidney injury.⁴ Our study concentrated on prerenal factors among the several causes of AKI. Prerenal AKI is referred to as "volume responsive" when it develops as a result of decreased perfusion or hypovolemia for any reason (bleeding, gastrointestinal, cutaneous, or urine losses⁵). Electrolyte abnormalities are common in children with diarrhoea.

It could go unnoticed and cause mortality and morbidity. To ensure that the frequent electrolyte abnormalities are corrected, prompt identification, a high degree of suspicion, and extensive comprehension are required. The present work was undertaken to study the common electrolyte abnormalities in diarrhoea and its impact on the mortality.

AIM AND OBJECTIVE.

- 1) To determine the incidence and clinical importance of Hypokalemia, Hypernatremia, Hyponatremia, Hypochloremia and Hypoglycemia in children with acute diarrhoeal illness.
- 2) To assess the renal function in acute gastroenteritis

MATERIALS AND METHODS

This hospital based prospective study was conducted with 151 children in the age group of 1 month to 5 years admitted to paediatric ward with history of diarrhoea, significant dehydration, weight loss at AL AMEEN MEDICAL COLLEGE AND HOSPITAL from February 2021 to December 2022. Patients were selected based on inclusion and exclusion criteria. Analysis was done using appropriate statistical tools.

Inclusion Criteria:

1. 1 month to 5 years of age with acute gastroenteritis
2. Some/severe dehydration.
3. Excessive vomiting.
4. Large frequent stools

Exclusion Criteria:

1. Any child with history of diarrhoea more than 2 weeks at the time of admission
2. Neonates (less than 1 month of age) and children above 5 years
3. Children with dysentery
4. Altered sensorium
5. Pneumonia

METHODOLOGY

A detailed history was taken from the patients with acute gastroenteritis of age 1 month to 5 years. The procedure of the study was explained & required consent for the study was taken. Examination of the patients was done & all relevant data were obtained. The clinical history included the Patients name, age, sex, history of loose stools and excessive vomiting, history of large frequent stools and abdominal distention and Feeding pattern.

Detailed clinical examination was done to look for thirsty, irritability, pinched look, sunken eyes, dry inner side of cheeks, abdominal distention, deep and rapid breathing, weak and thready pulse, falling blood pressure, reduced quantity of urine according to WHO dehydration assessment scale. Investigations which were included the basal Hematological and Biochemical investigations including

hemoglobin, total and differential white cell counts, platelets & peripheral smear examination.

Renal function test and basal random blood sugar, Serum electrolytes were determined at '0' hour(admission) and once between 24 to 48 hours(post hydration). Stool microscopy for fecal leucocytes per high power field and parasites.

STATISTICAL ANALYSIS:

Categorical data was represented in the form of frequency and percentage. Association between variables were assessed with Chi Square Test. Quantitative data was represented as mean and standard deviation. A P value of <0.05 was considered statistically significant. Data was analyzed with IBM SPSS Version 25 for windows.

RESULTS AND OBSERVATIONS

The present prospective study was conducted in the Department of Paediatrics, Al Ameen medical college, Vijayapura over a period of 22 months from February 2021 to December 2022 on patients with acute diarrhoea. A total of 151 children with acute diarrhoea aged more than 1 month to 5 years were selected for the study. Among the study population (n=151), most of the cases were below 1 year of age (67) 44.4% followed by above 3 years (66) 43.7% and 1-2 years (18) 11.9%, males were 80(53%) and females were 71 (47%), Among the study population (n=151) who had acute diarrhoea, 92 (60.9%) patients had no dehydration and 59 (39.1%) had some dehydration as shown in **figure 1**, 43(28%) had Abdominal distention and remaining 108(72%) did not have abdominal distention as in **figure 2**. v.cholera was isolated from the stool of 10 patients (6.6%) who had acute diarrhoea as in **figure 3**.

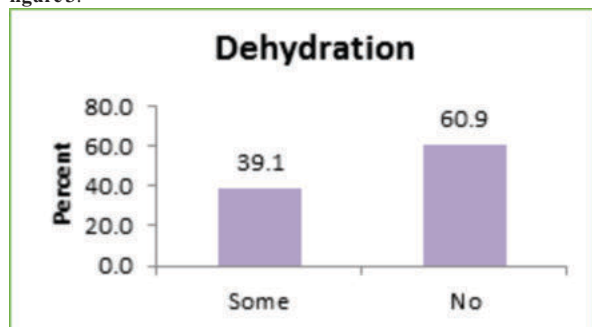


Figure 1

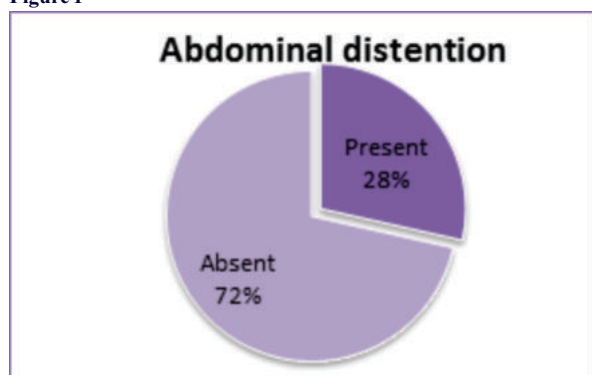


Figure 2

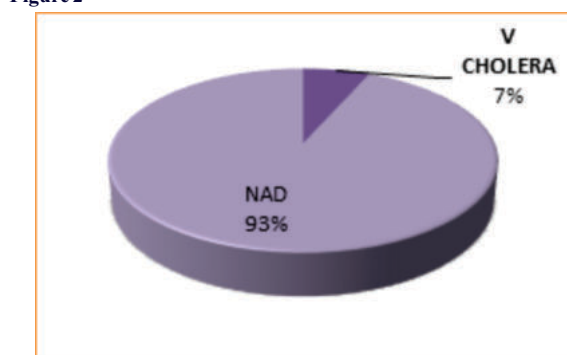


Figure 3

Frequency of loose motion and vomiting shown in **Table 1** and **2**

Table 1

Frequency of Vomiting	No of Cases	Percent
0	48	31.8
1	10	6.6
2	21	13.9
3	25	16.6
4	26	17.2
5	7	4.6
6	4	2.6
7	3	2.0
8	2	1.3
10	3	2.0
12	1	0.7
14	1	0.7
Total	151	100.0

Table 2

Frequency of Loose Motion	No of Cases	Percent
3	17	11.3
4	30	19.9
5	19	12.6
6	18	11.9
7	5	3.3
8	16	10.6
10	29	19.2
12	3	2.0
13	1	0.7
15	12	7.9
20	1	0.7
Total	151	100.0

Table 3

Parameters	Mean	Std. Deviation	Minimum	Maximum
Age in Months	26.24	20.34	3.00	60.00
Duration of Loose Motion in days	2.24	1.45	1.00	7.00
Duration of Vomiting in days	1.13	1.17	0.00	5.00
Weight in Kgs	9.82	3.94	1.50	18.00
B. GLUCOSE (mg/dl)	78.21	19.57	32.00	119.00
UREA (mg/dl)	32.14	6.99	19.00	48.00
CREATININE (mg/dl)	0.56	0.34	0.20	1.70
Na (mmol/L)	136.77	5.85	124.00	152.00
K (mmol/L)	4.04	0.67	2.20	6.00
Chloride	104.62	5.65	94.00	118.00

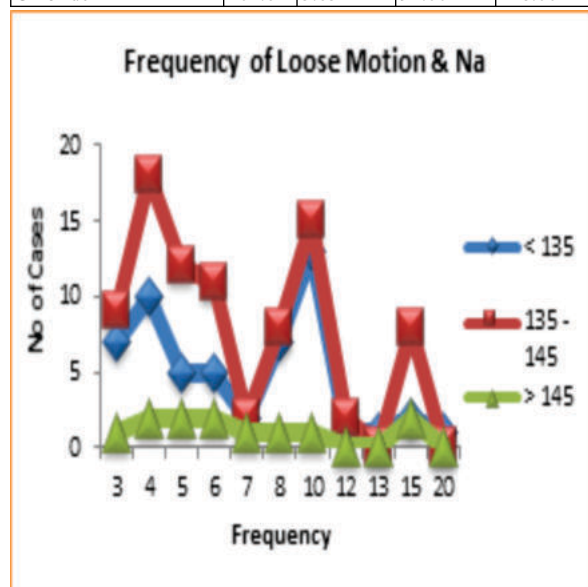


Figure 4

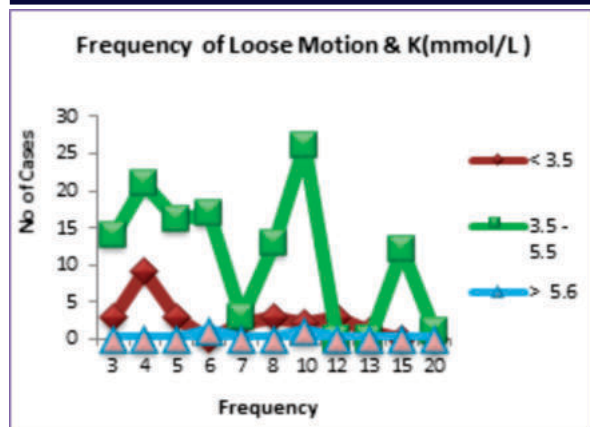


Figure 5

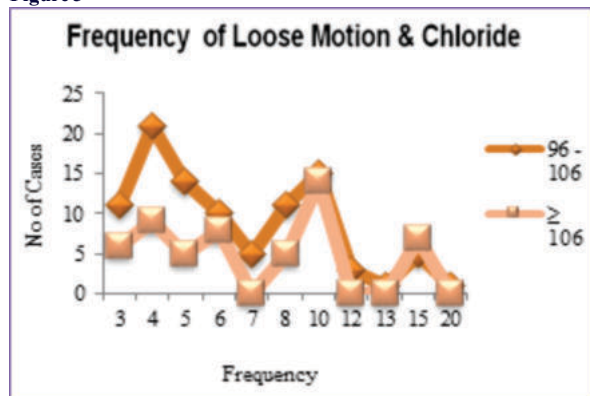


Figure 6

As shown in **table 3**, majority 103(68.2%) of the patients had normal urea levels followed by high urea level in 46(30.5) patients and low urea level in 2 patients (1.3%). 100(66.2%) had normal glucose levels followed by hypoglycemia seen in 28(18.5%) patients and hyperglycemia in 23 (15.2%) patients, normal creatinine level was seen in 71 (47%) patients whereas high creatinine level was seen in 80 (53%) cases. Normal level of sodium was seen in 85 (56.3%) cases, followed by Hyponatremia in 54 (35.8%) cases and Hypernatremia in 12 (7.9%) cases (**figure 4**). Potassium level was normal in 123 (81.5%) cases, Hypokalemia in 26 (17.2%) cases and Hyperkalemia in 2 (1.3%) cases. As the frequency of loose motion increased, potassium level decreased and is statistically significant (**figure 5**). Majority of 97 (64.2%) children had normal chloride levels followed by 40 (26.4%) children who had low chloride levels and 14 (9.2%) children had high chloride levels (**figure 6**).

DISCUSSION

The present work was undertaken to study the common electrolyte abnormalities in diarrhoea and its impact on the mortality. The most common age group in the present study was aged less than 1 year(44.4%) followed by 3-5 years(43.7%). Shah GS et al⁶ study showed Majority (70%) of patients were below 2 years of age. Male patients(53%) outnumber female patients(47%). Rebecca Oketcho et al⁷ showed that nearly all children (99.5%) resided in Morogoro and there were more male children (57.9%) than female. Most of the patients had weight 6-10 kgs(43.7%) followed by 11-15 kgs(28.5%). 17 patients with >15 kgs and 25 patients with <5 kgs. Mean weight of the patients presented was 9.8kgs. In our study v cholera was isolated from stool of 10 patients.i.e 6.6%.

All patients had loose motion, with duration of 12 hrs to maximum of 7 days with frequency of 3 to 20 episodes with highest of 30 cases had 4 times per day(19.9%) followed by 10 times(19.2%) in 29 cases, 19 had 5 episodes, 17 had 3,16 cases had 8 episodes. Ankireddy et al⁸ studied 250 cases presented with history of passage of loose motions with a frequency ranging from 6-12 /day. Most of the patients had no vomiting 48 (31.8%). Frequency of vomiting ranging from 1 to 14 times over a period of 12hrs to 5 days. Among the patients who had vomiting, maximum cases 26 (25.2%) showed 4 times/day with average of 1.13 times per day. Ankireddy et al⁸ reported 71% cases with

vomiting in their study done among 250 cases. 60.9% patients had no signs of dehydration and remaining 39.1% had some dehydration with dry tongue, sunken eyes, thirst, delayed skin pinch etc. Dastidar et al³ showed 83% (166) of the children had moderate degree of dehydration and 34 children had severe dehydration Majority of the patients 108(72%) were not having abdominal distension and 43(28%) were having abdominal distension. 42% of Hyponatremic children and 65% of Hypokalemic children had abdominal distension. Dastidar et al³ study showed 22% (44) cases had associated abdominal distension.

Most of the patients 103(68.2%) had normal urea levels followed by increased levels in 46(30.5%) patients. The increase in serum urea was directly proportional to increase in the number of loose stools. Gupta BK et al⁹ study, Out of 100 cases enrolled in the study, 71(71%) had normal urea, whereas 29 (29%) had increased serum urea level. 80(53%) had increased levels of creatinine followed by normal levels in 71 (47%) patients. 45% of Increased serum creatinine had some degree of dehydration. Gupta BK et al⁹ study showed that 62 (62%) had increased serum creatinine, while 38 (38%) had normal serum creatinine level. 66.2% had normal glucose levels followed by hypoglycemia in 18.5%. Subba Gangaraj et al¹⁰ showed 3.9% of cases had hypoglycaemia.

In this study 54(35.8%) patients had low sodium levels and 85(56.3%) patients had normal levels. The incidence of hypernatremia was 15.7% in a study by Subba Gangaraj et al¹⁰, also showed 51% hypokalemia who were severely malnourished, In our study most of the patients(81.5%) had normal potassium levels followed by low levels in 17.2% patients. In our study 97(64.2%) had normal chloride values followed by hypochloremia in 40(26.4%) patients and hyperchloremia in 14(9%) patients respectively. Dastidar et al³ study showed 86.5% Normochloremia, 25 (12.5%) Hypochloremia and 2 (1%) had Hyperchloremia.

CONCLUSION

Acute diarrhoea is a major health problem causing morbidity and mortality even today. To tackle this, safe water supply and sanitation are of utmost importance among other preventive measures like health education regarding hand washing, waste disposal, good personal and domestic hygiene etc among parents and children. Patients who present with acute diarrhea and dehydration usually does not require aggressive correction of electrolytes. They do very well with ORS & fluid correction as recommended by W.H.O.

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