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Original Research Article

Dyselectrolytemia in under-five children with acute diarrhoea-induced dehydration: a cross-sectional study in a South-East Nigerian hospital

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ABSTRACT

Background: Diarrhoeal disease contributes significantly to preventable deaths among under-fives globally. Associated dyselectrolytemia is a major contributor to morbidity and mortality in these children. The aim of the study was to determine the prevalence and pattern of serum electrolyte derangement among under-fives with dehydration due to acute diarrhoea.

Methods: It was a hospital-based descriptive cross-sectional study conducted at the Federal Medical Centre, Umuahia involving 150 under-five children with dehydration due to acute diarrhoea from October 2018 to January, 2020. Clinical detail and degree of dehydration were recorded. The serum electrolytes were estimated using Ion selective electrode method.

Results: The overall prevalence of electrolyte derangement was 62.6%. Hyponatraemia was the commonest electrolyte derangement, accounting for 31.3% of cases. Hypokalaemia and metabolic acidosis occurred in 24% and 12.7% of cases respectively. Across the different degrees of dehydration hyponatremia was 5 times more likely to develop in the severely dehydrated (OR 5.25, p=0.001) compared to the mildly dehydrated. The odds of developing hypokalaemia were 17 times more likely in the moderately dehydrated (OR 17.21, p=0.007) and 38 times more likely in the severely dehydrated Subjects (OR 38.50, p≤0.001).

Conclusions: The frequency of electrolyte derangements was high and increased with the increasing severity of dehydration. Routine estimation of serum electrolytes is advocated for under-five children with acute diarrhoea, especially with moderate and severe dehydration. Also, the use of sodium and potassium-containing fluids can be instituted as choice fluids in resource-poor settings without laboratory support.

Keywords: Serum electrolytes, Dehydration, Acute diarrhoea, Under-fives, Hyponatremia

INTRODUCTION

Diarrhoea is commonly defined as the passage of three or more loose stools per day and is said to be acute when the duration lasts less than two weeks.[1] Globally, diarrhoea is among the leading causes of under-five mortality after pneumonia, accounting for approximately 8 percent of all deaths among children under the age of five worldwide.[2,3] The diarrhoea-related morbidity and mortality are due to the associated fluid and electrolyte derangements and this further results in longer inpatient hospital stay and increased cost of care.[4-8] Therefore early recognition and goal-directed interventions to correct these electrolyte derangements when present becomes imperative in improving clinical outcome of children with dehydration due to acute diarrhoea.[9,10] The clinical signs of serum electrolyte abnormalities are not always evident and occasionally do not correlate with the laboratory findings derangements. This often leads to fatal outcomes and underscores the need for this study to improve the case management approach in acute diarrhoea.[11] Knowledge of the prevalence of serum electrolyte abnormalities in paediatric patients with dehydration due to acute diarrhoea in our locality may thus guide clinicians in their approach to treatment and monitoring and may also assist policymakers in the re-designing of diarrhoeal treatment manuals, as well as in the detection of clinically undetected and potentially harmful electrolyte abnormalities, thus enabling correction of the abnormalities and prevention of potential morbidity and mortality. The thrust of this study, therefore, was to determine the pattern and prevalence of serum electrolyte derangements in under-five children with dehydration due to acute diarrhoea at the Federal Medical Centre (FMC) Umuahia.

METHODS

Study area

The study was conducted at the children's outpatient clinic (CHOP) and children's emergency ward (CHEW) of the Federal Medical Centre (FMC) Umuahia, a tertiary healthcare facility. The CHEW and CHOP are the two major entry points for paediatric medical cases in the facility. CHEW opens 24-hours daily, all year round and receives children aged 1 month to 17 years with emergency conditions. CHOP runs every day except on weekends and public holidays.

Study type

It was a hospital-based descriptive cross-sectional study conducted from October 2018 to January 2020.

Study population

The study population included 150 children aged 2 months to 60 months with a primary diagnosis of acute diarrhoea and whose caregivers gave consent. Children with severe acute malnutrition, blood in stool and those who received intravenous fluid within 6 hours prior to admissions were excluded from the study. A hundred and fifty subjects were recruited consecutively for the study, made up of fifty each with mild, moderate, and severe dehydration.

Inclusion and exclusion criteria

All children between the ages of two months and 59 months presenting to the emergency room or outpatient clinic with acute diarrhoea, whose parents/caregivers consented to the study were included. Those excluded from the study includes children who have received intravenous infusion within 6 hours prior to presentation, children who had severe acute malnutrition, chronic kidney disease and dysentery.

Definition of terms

A case of acute diarrhoea for this study was defined as an increase by three or more bowel movements (above normal or baseline) with the stool being liquid in consistency and lasting a few hours to less than 14 days.[1,12] Hyponatraemia and hypernatraemia were defined as serum sodium below 136 mmol/l and above 146 mmol/l respectively.[13,14] Hypokalaemia and hyperkalaemia were defined as serum potassium below 3.5 mmol/l and above 5.0 mmol/l respectively.[14,15] Metabolic acidosis and metabolic alkalosis were defined as serum bicarbonate levels below 20 mmol/l and above 28 mmol/l respectively.[13,14]

Data collection and analysis

Structured interviewer-administered questionnaire was used to obtain information on some demographic and clinical parameters from parents/caregivers of the recruited children. The level of dehydration was assessed and categorised as mild, moderate, and severe using a clinical dehydration sign chart adapted for this study from the World Health Organisation (WHO) and the American subcommittee on gastroenteritis criteria. Under aseptic conditions, two millilitres of venous blood sample was obtained from each of the children into a lithium-heparin bottle for the estimation of serum sodium, potassium and bicarbonate. The sample was transported within one hour to the laboratory for analysis. Serum electrolytes were done using the ion selective electrode method (9180 ROCHE® electrolyte analyser). The data analysis was done using the statistical package for social sciences (SPSS) version 20.0. Descriptive statistics of frequencies and percentages were used to present the categorical variables. Inferential statistics used included Chi-square for the test of significance for categorical variables. Level of significance was set at p value of <0.05.

RESULTS

General characteristics of the study participants

There were 150 patients (50 each for mild, moderate, and severe dehydration) comprising 91 (60.7%) males and 59 (39.3%) females with a male to female ratio of 1.5:1. The age of the subjects ranged from five months to 48 months, with 139 (92.7%) under the age of three years, mean age was 18.5±9.8 months. One hundred and thirty-three (88.7%) of the subjects were urban dwellers. The source of drinking water was borehole for 117 (78%) of the respondents (Table 1).

Prevalence of serum electrolyte derangements

Out of 150 subjects, 94 (62.6%) had one or more forms of electrolyte derangement. Hyponatraemia was the commonest electrolyte abnormality noted in 47 (31.3%) subjects followed by hypokalaemia 36 (24%) and metabolic acidosis 19 (12.7%) (Table 2).

Table 1: Sociodemographic characteristics of study participants.

Parameters	N	%
Age groups (months)		
≤12	54	36.0
>12-24	67	44.7
>24-36	18	12
>36-48	10	6.7
>48-60	1	0.7
Total	150	100.0
Sex		
Female	59	39.3
Male	91	60.7
Total	150	100.0
Residence		
Rural	17	11.3
Urban	113	88.7
Total	150	100.0
Social class		
Upper class	97	64.7
Middle class	48	32.0
Lower	5	3.3
Total	150	100.0

Table 2: Prevalence of the serum electrolyte derangement among the participants.

Parameters	N	%
Sodium		
Hyponatremia	47	31.3
Normal	87	58.0
Hypernatremia	16	10.7
Total	150	100.0
Potassium		
Hypokalemia	36	24.0
Normal	93	62.0
Hyperkalaemia	21	14.0
Total	150	100.0
Bicarbonate		
Metabolic acidosis	19	12.7
Normal	117	78.0
Metabolic alkalosis	14	9.3
Total	150	100.0

Table 3: Prevalence of serum electrolyte derangement in subjects according to the levels of dehydration.

Parameters	Electrolyte derangement			Total	χ2	P value
	Sodium					
Dehydration	**Hyponatremia**	**Hypernatremia**	**Normal**			
Mild	8 (16.0)	2 (4.0)	40 (80.0)	50 (100)	-	-
Moderate	14 (28.0)	5 (10.0)	31 (62.0)	50 (100)	24.25	<0.001
Severe	25 (50.0)	9 (18.0)	16 (32.0)	50 (100)	20.30†	<0.001†
Total	47 (31.3)	16 (10.7)	87 (58)	150	-	-
	Potassium					
	Hypokalaemia	**Hyperkalaemia**	**Normal**	-	-	-
Mild	1 (2)	5 (10)	44 (88)	50 (100)	-	-
Moderate	13 (26)	11 (22)	26 (52)	50 (100)	30.25	<0.001
Severe	22 (44)	5 (10)	23 (46)	50 (100)	11.83†	0.001†
Total	36 (24)	21 (14)	93 (62)	150	-	-

Continued.

Parameters	Electrolyte derangement Bicarbonate			Total	χ2	P value
	Acidosis	Alkalosis	Normal	-	-	-
Mild	3 (6)	3 (6)	44 (88)	50 (100)	-	-
Moderate	2 (4)	9 (18)	39 (78)	50 (100)	21.42	<0.001
Severe	14 (28)	2 (4)	34 (68)	50 (100)	6.53†	0.011†
Total	19 (12.7)	14 (9.3)	117 (78)	150	-	-

†=represents Mantel haenszel Chi squared test for trend and its P value.

Table 4: Odds of serum electrolyte derangement in subjects with different degree of dehydration.

Electrolyte derangement					
Dehydration	**N**	**N (%)**	**95% CI**	**OR (95% CI)**	**P value**
Hyponatremia					
Mild	50	8 (16.0)	6.9-26.2	1	-
Moderate	50	14 (28.0)	165-40.0	2.04 (0.7-54)	0.152
Severe	50	25 (50.0)	377-62.5	5.25 (2.0-13.4)	0.001
Total	150	47 (31.3)	23.7-393	-	-
Hypernatremia					
Mild	50	2 (4.0)	0-10.4	1	
Moderate	50	5 (10.0)	3.6-18.8	2.66 (0.49-14.4)	0.255
Severe	50	9 (180)	76-29.6	5.26 (1.07-257)	0.040
Total	150	16 (10.7)	6.3-15.5	-	-
Hypokalaemia					
Mild	50	1 (2.0)	(0.0-6.8)	1	-
Moderate	50	13 (26.0)	(14.3-39.6)	17.21 (2.1 – 137.5)	0.007
Severe	50	22 (44.0)	(28.8-59.2)	38.50 (4.9 – 301.1)	0.001
Total	150	36 (24.0)	(17.6-31.4)	-	-
Hyperkalaemia					
Mild	50	5 (10.0)	(2.4-18.0)	1	-
Moderate	50	11 (22.0)	(11.1-33.3)	2.53 (0.8-7.9)	0.109
Severe	50	5 (10.0)	(2.1-19.2)	0.999 (0.3-3.6)	0.999
Total	150	21 (14)	(8.5-20.2)	-	-
Acidosis					
Mild	50	3 (6)	0-13.0	1	-
Moderate	50	2 (4)	0-10.0	0.65 (0.1-4.0)	0.648
Severe	50	14 (28)	16.0-39.8	6.09 (1.6-22.8)	0.007
Total	150	19 (12.7)	7.7-18.1	-	-
Alkalosis					
Mild	50	3 (6)	0.0-14.0	1	
Moderate	50	9 (18)	8.2-30.2	3.43 (0.8-13.5)	0.078
Severe	50	2 (4)	0.0-10.6	0.65 (0.1-4.1)	0.648
Total	150	14 (9.3)	4.9-14.3	-	-

Table 5: Multinomial Logistic regression of the predictors of sodium derangement.

Electrolytes	Predictors	AOR	95%CI	P value
	Severity of dehydration			
	Mild	Reference	-	-
	Moderate	2.8	0.8-9.2	0.09
	Severe	6.3	2.0-20.0	**0.002**
	Zinc use			
Hyponatremia	Yes	3.6	1.3-8.8	**0.008**
	No	Reference	-	-
	Vomiting			
	Yes	1.4	0.4-4.4	0.59
	No	Reference	-	-
	ORS use			

Continued.

Electrolytes	Predictors	AOR	95%CI	P value
	Yes	0.7	0.3-1.7	0.38
	No	Reference	-	-
	Social class			
	Lower	0.8	-	0.83
	Middle	1.3	0.5-3.2	0.53
	Upper	Reference	-	-
Hypernatremia	**Severity of dehydration**			
	Mild	Reference	-	-
	Moderate	5.9	0.8-42.4	0.08
	Severe	25.3	3.8-168-6	**0.001**
	Zinc use			
	Yes	0.5	0.1-1.9	0.28
	No	Reference	-	-
	Vomiting			
	Yes	0.6	0.1-2.4	0.43
	No	Reference	-	-
	ORS use			
	Yes	1.8	0.5-7.0	0.38
	No	Reference	-	-
	Social class			
	Lower	3.2	0.6-15.4	0.10
	Middle	0.8	0.2-2.8	0.66
	Upper	Reference	-	-

Reference category for the dependent variable = Normal values of serum sodium, AOR = Adjusted Odd Ratio.

Table 6: Multinomial Logistic regression of the predictors of potassium derangement

Electrolytes	Predictors	AOR	95%CI	P value
Hypokalemia	**Severity of dehydration**			
	Mild	Reference	-	-
	Moderate	16.1	0.8–42.4	0.01
	Severe	36.1	3.8–168.6	**0.001**
	Zinc use			
	Yes	0.9	0.3-2.3	0.89
	No	Reference	-	-
	Vomiting			
	Yes	2.3	0.5-9.7	0.27
	No	Reference	-	-
	ORS use			
	Yes	1.5	0.5-4.5	0.58
	No	Reference	-	-
	Social class			
	Lower	1.6	0.1-17-8	0.69
	Middle	0.7	0.3-1.8	0.43
	Upper	Reference	-	-
Hyperkalemia	**Severity of dehydration**			
	Mild	Reference	-	-
	Moderate	3.0	0.7-13.6	0.16
	Severe	3.7	0.9-15.5	0.07
	Zinc use			
	Yes	1.1	0.3-4.1	0.86
	No	Reference	-	-
	Vomiting			
	Yes	3.1	0.6-16.6	0.19
	No	Reference	-	-

Continued.

Electrolytes	Predictors	AOR	95%CI	P value
	ORS use			
	Yes	0.3	0.1-1.1	0.06
	No	Reference	-	-
	Social class			
	Lower	1.9	0.1-27.8	0.64
	Middle	0.5	0.1-1.7	0.27
	Upper	Reference	-	-

Reference category for the dependent variable = Normal values of potassium, AOR = Adjusted Odd Ratio.

Table 7: Multinomial Logistic regression of the predictors of bicarbonate derangement.

Electrolytes	Predictors	AOR	95%CI	P value
Metabolic acidosis	**Severity of dehydration**			
	Mild	Reference	-	-
	Moderate	0.5	0.1–3.9	0.54
	Severe	6.8	1.4–32.6	**0.02**
	Zinc use			
	Yes	0.6	0.2–2.4	0.63
	No	reference	-	-
	Vomiting			
	Yes	3.2	0.6–17.1	0.18
	No	reference		
	ORS use			
	Yes	0.6	0.2–2.2	0.43
	No	Reference		
	Social class			
	Lower	1.7	0.1–21.0	0.70
	Middle	1.6	0.5–4.9	0.40
	Upper	Reference	-	-
Metabolic alkalosis	**Severity of dehydration**			
	Mild	Reference	-	-
	Moderate	3.1	0.5–20.6	0.24
	Severe	3.1	0.6–17.2	0.90
	Zinc use			
	Yes	0.1	0.0–0.9	**0.01**
	No	reference	-	-
	Vomiting			
	Yes	1.5	0.3–8.9	0.65
	No	Reference		
	ORS use			
	Yes	0.8	0.2–2.6	0.68
	No	Reference		
	Social class			
	Lower	2.9	0.2–46.2	0.45
	Middle	0.3	0.1–1.6	0.16
	Upper	reference	-	-

Reference category for the dependent variable = Normal values of bicarbonate, AOR = Adjusted Odd Ratio.

Relationship between serum electrolyte derangement and degrees of dehydration

A significant relationship was observed between the occurrence of electrolyte derangement and increasing degrees of dehydration from mild to severe. The prevalence of hyponatraemia was 16%, 28% and 50% in the mildly, moderately, and severely dehydrated subjects respectively. Hypokalaemia also showed the same positive trend of 2%, 26% and 44% in the mildly, moderately, and severely dehydrated respectively. This trend however was not observed for hyperkalaemia and bicarbonate derangement (Table 3). A positive trend with corroborating incremental odds ratio was also shown for the derangement in the electrolytes across the various degrees of dehydration. Subjects who were severely dehydrated had 5 times more likelihood of developing hyponatremia (OR 5.25, CI= 2.0-13.4, p=0.001) and hypernatremia (OR 5.26, CI=1.07-25.7, p=0.040) and 6 times more likelihood of developing metabolic acidosis (OR 6.09, CI=1.6-22.8, p=0.007) than those with mild dehydration. Hypokalaemia was 38 times more likely to occur in the severely dehydrated (OR 38.50, CI=4.9-301.1, p=0.001) and 17 times more likely in the moderately dehydrated (OR 17.21, CI=2.1-137.5, p=0.007) than those with mild dehydration (Table 4). Using the multinomial logistic regression model severe dehydration was observed as the predictor of hyponatraemia, hypernatraemia, hypokalaemia and metabolic acidosis (Table 5-7).

DISCUSSION

Serum electrolyte derangement among under-five children with dehydration due to acute diarrhoea was found to be prominent in this study. The 62.6% in this study compares favourably with findings in Iran (64.1%) and Pakistan (66.7%) despite obvious differences in subject composition across the categories of dehydration. The studies by Okposio et al in Benin and Ankiredy and Kumar in India recorded higher values of 89% and 80.8%.[13,16-18] Hyponatraemia was the most common derangement in this study with a prevalence of 31.3% which is similar to the prevalence rate of 37.9% documented by Chambuso et al.[19] Serum sodium abnormality are known predictors of morbidity and mortality in children with acute diarrhoea.[20] Sodium being a primary stool solute is lost during diarrhoeal disease and replacement of the diarrhoeal losses with hypotonic fluids leads to hyponatremia.[21] Varied prevalence rates have been documented for hyponatraemia in acute diarrhoea in children by some authors.[13,16,19,22-26] The prevalence of 31.3% in this study is however higher than the findings of Gauchan et al in Nepal,[24] Tavakolizadeh et al in Iran, Hayajeneh et al in Jordan and Dagar et al in India who documented prevalence rates of 11.2%, 10%, 3% and 9.1% respectively.[16,23,25] Soleimani et al in Tehran, Okposio et al and Onyiruka et al both in Benin city, Nigeria reported higher prevalence rates of 67.5%, 60.5% and 65.1% respectively than the index study.[13,22,26] The differences observed could be due to the differences in the clinical characteristics of the subjects and the cut-off values used for hyponatraemia in the studies. In the index study subjects above 5 years of age were excluded. This was to lay emphasis on under-fives who are more prone to fluid and electrolyte changes in acute diarrhoea than the older children. Gauchan et al and Tavakolizadeh et al had older children in their study and this could have accounted for the differences in the findings. The index study was conducted with all levels of dehydration represented; in contrast to Soleimani et al and Onyiruka et al who selected subjects with severe acute diarrhoea and severe dehydration only.[16,24,26] This may explain the lower rates in the index study compared to theirs.[23,26] In this study also hyponatraemia was defined as sodium levels less than 136 mmol/l in contrast to Tavakolizadeh et al (less than 135 mmol/l), Hayajeneh et al (less than 130 mmol/l), and Soleimani et al (less than 137 mmol/l) and thus the expected varied rates.[16] Hypernatraemia in acute diarrhoeal patients often develop as a result of fluid loss excess in comparison to sodium loss, and/or inadequate water replacement.[27] The prevalence rate of hypernatraemia of 10.7% documented in this study is comparable to the prevalence rate of 7% and 7.9% reported by Hayajeneh et al and Onyiruka et al respectively.[22,23] However the prevalence rates of 2.2% and 4.3% documented by Tavakolizadeh et al in Iran and Okposio et al in Benin City, Nigeria respectively was lower than in the index study.[13,16] The reason for this difference however is not clear. The studies by Dhyani et al and Dagar et al both in India documented a higher prevalence rate of 24.3% and 20.6% respectively.[25,28] This disparity in findings might be attributed to the differences in the nutritional status of the participants. The index study excluded those with severe acute malnutrition (SAM). This was to exclude the effect of SAM on electrolytes. About 28% and 7% of the subjects in the study by Dhyani et al and Dagar et al respectively had SAM and this may have affected the findings.[22,26]

Hypokalaemia in acute diarrhoea is usually due to increase potassium loss in the stool, and has been documented to be associated with increase in mortality in children with diarrhoea.[29] Hypokalaemia was observed in only 24% of the subjects in this study. This is comparable to the prevalence of 27.2% by Ankireddy et al in India.[18] In contrast however, it was lower than the prevalence of 44.5% and 44.3% described by Dhyani et al in India and Okposio et al in Benin, Nigeria respectively.[13,28] A lower prevalence of 13.64% was however documented in Calabar, South-south Nigeria by Uka et al.[30] These differences may possibly be due to the differences in clinical characteristics of the subjects, and the study population. The preponderance of hypokalaemia in patients with SAM and in the intensive care unit has been documented.[29,31] Thus the index study conducted in the outpatient clinic and children emergency ward with exclusion of subjects with SAM, had less subjects at risk of hypokalaemia than the study by Dhyani et al.[28]

Hyperkalaemia on admission have been reported as an independent risk factor for death in children less than five years of age hospitalised for diarrhoea.[32] The prevalence of hyperkalaemia among children with acute diarrhoea in the current study was 14%. This was higher than the prevalence of 2.4%, 0% and 1.1% documented in Iran by Soleimani et al, India by Ankireddy et al and in Benin, Nigeria by Okposio et al respectively.[13,18,26] The differences observed maybe the difference in the criteria for defining hyperkalaemia. The index study defined hyperkalaemia as serum potassium greater than 5 mmol/l. Okposio et al and Ankireddy et al defined hyperkalaemia as serum potassium greater than 5.5 mmol/l and thus may explain the higher prevalence in the current study.[13,18] Hyperkalaemia is not commonly expected in acute diarrhoea however it may occur in conditions leading to extracellular potassium shifts and/or decrease in renal excretion of potassium. The shifts from the blood cell to blood plasma often occurs by mechanical trauma during venepuncture or due to the clotting process invitro.[33]

Metabolic acidosis has been reported to be associated with higher death rates when compared with those without metabolic acidosis.[34] Bicarbonate is a primary stool anion thus with diarrhoea there is bicarbonate loss in stool. The greater the stool volume loss and with renal function deterioration, the more significant the bicarbonate loss leading to acidosis. The prevalence of metabolic acidosis in the current study was 12.7%. This was lower than the prevalence of 53%, 56.5%, 59.5% and 94.53% by Sharifuzzman et al in Bangladesh, Soleimani et al in Iran, Okposio et al in Benin city and Dhyani et al in India respectively.[13,16,24,26] The differences observed may be explained by the differences in the clinical characteristics of the subjects and the defining criteria for metabolic acidosis adopted by each study. The index study used only serum bicarbonate levels lower than 20mmol/l to define metabolic acidosis. Both Dhyani et al and Soleimani et al used the pH value only to define acidosis which however does not distinguish between respiratory and metabolic acidosis. Also Sharifuzzman et al defined metabolic acidosis using the pH value of less than 7.35 and serum bicarbonate less than 22 mmol/l.[26,28,34] Thus the lower cut-off used for serum bicarbonate levels and the non-estimation of the pH levels in the index study may explain the lower rates compared to the other studies. The index study had patients with mild, moderate and severe dehydration in equal proportion and may explain the lower rate seen in the current study when compared to Okposio et al in Benin City Nigeria despite both studies having similar criteria for the definition of metabolic acidosis.[13]

Vomiting which is often associated with diarrhoea, leads to the loss of potassium and hydrogen chloride (gastric acid) and this may lead to hypochloremic metabolic alkalosis.[35] The prevalence of metabolic alkalosis in the index study was 9.3%, which is higher than the 1% reported by Okposio et al.[13] This difference may be due to the defining value used as cut off. The index study defined metabolic alkalosis as serum bicarbonate levels greater than 28 mmol/l and thus may explain the higher prevalence rate when compared to Okposio et al who used serum bicarbonate levels of greater than 30 mmol/l to define metabolic alkalosis.[13]

The prevalence rates of hypokalaemia, hyponatraemia, metabolic acidosis, and hypernatraemia in the current study also showed a rising trend with increasing severity of dehydration. Sodium, potassium, and bicarbonate are primary stool solutes and thus increasing stool losses with increasing levels of dehydration leads to increased sodium, potassium and bicarbonate loss. The severity of dehydration is a reflection of the total body water loss, and when this is in excess of stool sodium loss, hypernatremia ensues and perhaps worsens with increasing severity. In Benin City, Nigeria Okposio et al documented a similar rising trend for metabolic acidosis with increasing severity of dehydration, but not for other analytes.[13] These disparities observed maybe explained by the differences in sample sizes across the various levels of dehydration. The index study had an equal spread of the sample size across the levels of dehydration thus creating a better comparison frame across the levels of dehydration.

Limitations

A potential limitation in this study was not excluding those who used improperly constituted oral rehydration salts. This may influence the component electrolyte derangements observed in the study. Future studies may therefore exclude any form of rehydration fluid intervention, although this may be clinically impracticable because mothers are taught to use the oral rehydration fluids even at home for intervention.

CONCLUSION

Serum electrolyte derangements among under-five children with dehydration due to acute diarrhoea is notable, with hyponatraemia and hypokalaemia as the most prevalent. The derangements were also observed to occur more in the severely dehydrated compared to moderately and mildly dehydrated. Since diarrhoea-related morbidity and mortality are mainly due to serum electrolyte derangements we recommend serum electrolyte estimation, especially among those with moderate and severe dehydration. This will enhance early detection and prompt correction of these derangements to mitigate fatal outcomes in affected children with acute diarrhoea. Also, in resource-poor settings where adequate laboratory support may not be readily available, the commencement of sodium and potassium-containing fluid should be the empirical practice.

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