COMPARISON OF SERUM SODIUM BEFORE AND AFTER USE OF REDUCED OSMOLARITY ORS SOLUTION IN CHILDREN WITH ACUTE WATERY DIARRHEA

Samar Fatima Ijaz[1], M Faheem Afzal[1], Syed M Javed Iqbal[1], M Ashraf Sultan[1], Asif Hanif[2]

ABSTRACT

Background: Oral rehydration salt (ORS) solution has reduced childhood deaths from diarrhea. Recent studies suggest that ORS solutions with reduced osmolarity may be more effective. However, there is concern about hyponatremia with reduced osmolarity ORS. **Objectives:** To compare the serum sodium level before and after the use of reduced osmolarity ORS solution in children with acute watery diarrhea (AWD). **Patients and Methods:** This comparative cross sectional study was conducted in the Department of Paediatrics Unit-I, King Edward Medical University/ Mayo Hospital, Lahore from March to August 2009. Sample was collected by non probability purposive sampling. After consent, a total of 100 children of age 2 to 60 months, consistent with clinical case definition of AWD (passage of 3 or more loose stools/day with duration of less than 14 days) were enrolled. Those children with severe dehydration or having clinical evidence of systemic infection were excluded from the study. Each child was offered reduced osmolarity ORS solution. Serum sodium level was measured before and 6 hour after use of ORS. Data was entered in SPSS 17 and paired sample t-test was applied to compare serum sodium level before and after use of ORS. **Results:** Mean serum sodium level before and 6 hour after use of reduced osmolarity ORS solution was 133±3.4mEq/L and 133±2.9mEq/L, respectively. There was statistically insignificant change in serum sodium level after use of reduced osmolarity ORS solution.(p value 0.173) Similar results were found for subgroups of age and gender. **Conclusion:** Reduced osmolarity ORS solution has no statistically significant risk of hyponatremia in children with AWD.

Key words Acute watery diarrhea, Dehydration, Hyponatremia, Oral rehydration solution, Reduced osmolarity ORS

INTRODUCTION

Diarrheal diseases continue to be a significant burden in terms of childhood morbidity and mortality.[1] Since 1978, the World Health Organization (WHO) and the United Nations Children's International Emergency Fund (UNICEF) have recommended the use of single formulation (Na 90 mmol/L, and osmolarity 311 mosmol/L) of ORS solution for prevention and treatment of dehydration from diarrhoeal diseases.[2] However, there has also been concern of osmotically driven increase in the stool output with use of WHO-ORS. For this reason, recent efforts to improve the efficacy of ORS have focused particularly on solutions of reduced osmolarity (Na =75 mmol/L, and osmolarity 245 mosmol/L).[3] Recent studies suggest that the solutions that contain lower concentrations of sodium may be more effective.[3,4,5] Nevertheless, some concern is there about the possible risk of hyponatremia with this solution.[2] Local trials to evaluate risk of hyponatremia with use of reduced osmolarity ORS are unfortunately lacking. Therefore, this study was conducted to compare the serum sodium level before and after the use of reduced osmolarity ORS solution in children with AWD.

1. King Edward Medical University/ Mayo Hospital, Lahore.
2. Department of Biostatistics,PGMI Gulab Devi Hospital, Lahore

Correspondence: Dr. Samr Fatima Ijaz
WMO, Department of Paeds King Edward Medical University / Mayo Hospital, Lahore.

PATIENTS AND METHOD

This comparative cross sectional study was conducted in the Department of Paediatrics Unit-I, King Edward Medical University/ Mayo Hospital, Lahore from March to August 2009. Sample was collected by non probability purposive sampling. After consent, a total of 100 children of age 2 to 60 months, consistent with clinical case definition of AWD (passage of 3 or more loose stools/day with duration of less than 14 days) were enrolled. Those children with severe dehydration or having clinical evidence of systemic infection were excluded from the study. Each child was offered reduced osmolarity ORS solution. Serum sodium level was measured before and 6 hour after the use of reduced osmolarity ORS solution. Patients showing no improvement within 6 hours were treated according to the individual merit. Data was entered in SPSS 17 and paired sample t-test was applied to compare the serum sodium level before and after the use of reduced osmolarity ORS solution.

RESULTS

Total study population was 100 children. Mean age of patients was 22±16 months. Most common age group was infancy (45%). Male to female ratio was 1.4:1. (Figure I) Mean serum sodium level before and 6 hour after the use of reduced osmolarity ORS solution was 133±3.4 and 133±2.9 respectively. There was statistically insignificant hyponatremia after the use of reduced osmolarity ORS solution (p value 0.173). Serum sodium level before and after the use of reduced osmolarity ORS solution for subgroups of age and gender was also statistically insignificant. For age, p value was 0.941 and 0.211 before and after use of ORS respectively, while for gender, it was 0.919 and 0.553 respectively. (Table:I)

Figure I: Age and Gender Distribution (n=100)

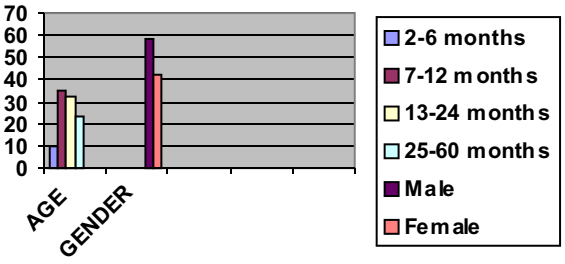

Table I: Comparison of serum sodium before and after use of reduced osmolarity ORS (n=100)

	Age groups	n	Mean	SD	p-value
Serum Na before giving ORS	≤ 6 months	10	133.00	2.494	0.941
	7-12 months	35	133.06	3.865	
	13-24 months	32	133.19	3.316	
	25-60 months	23	133.61	3.652	
	Total	100	133.22	3.486	
Serum Na after giving ORS	≤ 6 months	10	132.30	2.751	0.211
	7-12 months	35	133.74	2.442	
	13-24 months	32	133.31	2.693	
	25-60 months	23	134.48	3.666	
	Total	100	133.63	2.894	
	Gender	**n**	**Mean**	**SD**	**p-value**
Serum Na before giving ORS	Male	58	133.19	3.644	0.919
	Female	42	133.26	3.299	
	Total	100	133.22	3.486	
Serum Na after giving ORS	Male	58	133.48	2.792	0.553
	Female	42	133.83	3.052	
	Total	100	133.63	2.894	

DISCUSSION

Though often considered a benign disease, AWD remains a major cause of morbidity and mortality in children. The worst complication of AWD is dehydration. The use of WHO-ORS and consequent development of reduced osmolarity ORS has contributed to the dramatic global reduction in deaths from diarrheal diseases.[6] Present study has shown that mean serum sodium level before and 6 hour after use of reduced osmolarity ORS solution was 133±3.4 and 133±2.9 respectively. There was no significant risk of developing hyponatremia with use of reduced osmolarity ORS. (p value 0.173). Our results are in accordance with the results from Alam et al[2] who, in phase IV clinical trial, demonstrated that the occurrence of symptomatic hyponatremia in children with AWD treated with the reduced osmolarity ORS was extremely rare (2%). Similar findings have been reported by Dutta et al.[7]

There are also reports of development of hyponatremia with use of reduced osmolarity ORS, but most authors found it statistically insignificant. Hahn et al[3] reported symptomatic hyponatremia in three RCTs but no obvious difference was found between both the treatment groups. Murphy et al[8] also searched out seven trials and found that biochemical hyponatremia (serum sodium <130mmol/L) was more common with reduced osmolarity ORS (RR1.67,CI 1.09 to 2.57; 465 participants, 4 trials); but for severe biochemical hyponatremia (serum sodium <125mmol/L), this was not significant (RR 1.58, CI 0.62 to 4.04; 465 participants, 4 trials). However, no trials reported symptomatic hyponatremia or death.

The strength of this study is that data on a very common problem regarding risk of hyponatremia with use of reduced osmolarity ORS was reported. Present study had limitation that it did not include the children of severe dehydration.

CONCLUSION

Reduced osmolarity ORS solution has no significant risk of hyponatremia in children with AWD.

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