

COMPARISON OF LOW OSMOLAR ORAL REHYDRATION SOLUTION VERSUS STANDARD ORAL REHYDRATION SOLUTION IN CHILDREN WITH ACUTE DIARRHOEA IN RELATION TO UNSCHEDULED INTRAVENOUS FLUID REQUIREMENT

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ABSTRACT

Objective: To determine requirement of unscheduled I/V fluid in children treated with low osmolar oral rehydration solution as compare to standard oral rehydration solution.

Study Design: Case control study.

Place and Duration of Study: Department of Paediatrics, Lahore General Hospital, Lahore, from Sep 2018 to Feb 2019.

Methodology: Sample size of 400 patients was calculated using WHO calculator. Patients were recruited through non probability consecutive sampling. Patients were randomly divided into two groups. For each patient detailed history was taken including demographic information. Group A patients (controls) receive standard oral rehydration solution and Group B patients will receive low osmolar oral rehydration solution (Cases). Each group was followed for 6 hours after the treatment. Data analysis was done using SPSS version 24. Chi-square test applied and p -value ≤ 0.05 found significant.

Results: A total of 400 cases were enrolled in the study. There were 220 (55%) male and 180 (45%) female in our study. Mean weight of patients was $9.46 \text{ Kg} \pm 5.9 \text{ SD}$. In group A, 8 patients showed unscheduled fluid requirement while 192 did not showed unscheduled fluid requirement. In group B, 32 patients showed unscheduled fluid requirement while 168 did not showed unscheduled fluid requirement ($p=0.000$).

Conclusions: Incidence of or need of, unscheduled I/V fluid in children treated with low osmolar oral rehydration solution is less as compare to standard oral rehydration solution for management of acute diarrhea with some dehydration. And hence low osmolar oral rehydration solution shows better acceptance in management of acute diarrhea.

Keywords: Diarrhea, Oral rehydration solution, Osmolar rehydration solution.

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INTRODUCTION

About 1.7 to 5 billion cases of diarrhea occur per year¹. It is most common in developing countries, where young children get diarrhea on average three times a year². Total deaths from diarrhea are estimated at 1.26 million in 2013-down from 2.58 million in 1990³. In 2012, it is the second most common cause of deaths in children younger than five (0.76 million or 11%)⁴. Frequent episodes of diarrhea are also a common cause of malnutrition and the most common cause in those younger than 5 years of age. Other long term problems that can result include stunted growth and poor intellectual development⁵.

The passage of 3 or 4 loose stools or more in 24 hours or single watery stool is defined as diarrhoea⁶. Diarrhoea is second leading cause of deaths with 1.5 million (18%) children under age of 5 years in the developing countries. World health organization estimates almost 2.5 billion episodes of diarrhea in a year in children <5 years of age³. The main complication of

diarrhoea is dehydration therefore treatment requires fluid replacement for dehydration⁷.

The use of standard world health organization ORS (WHO-ORS) has resulted in decreased mortality associated with acute diarrheal illness in children for the last two and a half decades. Now WHO has recommended low osmolarity ORS. The low osmolar oral rehydration solution with 75 mEq/L of sodium and 75 mmol/L of glucose with osmolarity of 245 mmol/L is more effective in acute diarrhoea with some dehydration. Its recommended dose is 75 ml/Kg in four hours⁸.

Low osmolar ORS causes increase solute dependent water absorption due to less concentration of glucose and sodium eventually causing 35% less requirement for intravenous fluid with decrease purging rate less number of vomiting. Review of 330 numbers of patients revealed that 8 patients (5%) treated with low osmolar ORS required unscheduled fluid while 20 patients (12%) treated with standard ORS required unscheduled fluid.

Sixty one percent of children with acute watery diarrhoea in developing countries do not receive the recommended treatment hence limited availability of data and in Pakistan fewer studies present on

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requirement of IV fluid need in children of acute diarrhoea.

Acute watery diarrhea is one of the major cause of morbidity & mortality in the world and our country lack comprehensive data. There is no study available at my center and only one in Pakistan, so present study aims to determine requirement of unscheduled I/V fluid in children treated with low osmolar ORS as compare to standard ORS.

METHODOLOGY

A case control study was conducted at department of Paediatrics, Lahore general Hospital, Lahore, from September 2018 to February 2019. Sample size of 400 patients was calculated (200 in each group) using 95% confidence interval, 80% power of study, expected percentage of dehydration as 5% in cases treated with low osmolar and 12% in standard ORS group¹⁰. Patients were selected through non probability consecutive sampling. Patients of both gender, age group 2 months to 5 years, patients presented with dehydration and acute diarrhea were included in study. Patients with severe dehydration, associated systemic illness (pneumonia etc), previously using antibiotics, diagnosed with persistent diarrhea (>14 days), patients already using ORS and 3rd degree malnourished children according to modified Gomez criteria were excluded from study. we took institutional ethical approval from respective hospital. Consent of parents was taken before conduction of study. Patients were randomly divided into two groups. For each patient detailed history was taken including demographic information. Group A patients (controls) receive standard ORS and group B patients will receive low osmolar ORS (cases). Each group was followed for 6 hours after the treatment and data collected on proforma. Outcome was measured by purging rate and episodes of vomiting per 6 hours along with requirement of unscheduled IV fluid. Data was analyzed using SPSS-24. Quantitative analysis was done in terms of mean and standard deviation while qualitative measurements were done in terms of frequency and percentages. Chi-square test was applied. *p*-value ≤0.05 was considered significant.

RESULTS

A total of 400 cases were enrolled in the study. There were 220 (55%) male and 180 (45%) female in our study. Mean weight of patients was 9.46kg ± 5.9 SD. In group A, 8 patients showed unscheduled fluid requirement while 192 did not showed unscheduled fluid requirement. In group B, 32 patients showed unscheduled fluid requirement while 168 did not showed unschedu-

led fluid requirement as shown in table-I. Stratification with respect to gender, age and duration of disease was insignificant (*p*>0.05).

Table-I: Comparison of unscheduled fluid requirement in cases and controls.

Unscheduled Fluid Requirement	Groups		Total	<i>p</i> -value
	Group A (Controls)	Group B (Cases)		
Yes	8	32	40	0.000
No	192	168	360	
Total	200	200	400	

Table-II: Stratification of unscheduled fluid requirement with respect to gender, age and duration of disease.

Groups	Gender	Unscheduled Fluid Requirement		Total	<i>p</i> -value
Group A	Male	118	102	220	0.654
	Female	88	92	180	
Group B	Male	110	104	400	
	Female	91	95	186	
Age					
Group A	3 months to 2 years	181	176	357	0.443
	3-5 years	19	24	43	
Group B	3 months to 2 years	180	177	357	
	3-5 years	19	24	43	
Duration of Disease					
Group A	1-5 days	164	164	328	0.234
	6-11 days	36	36	72	
Group B	1-5 days	160	162	322	
	6-11 days	40	38	78	

DISCUSSION

Oral rehydration solutions (ORS) have been used since decades and avoided millions of child deaths due to acute diarrhea^{11,12}. It is safe, effective and widely used in hospital and home for dehydration prevention. WHO recommended standard formulation of ORS with total osmolarity 311 mmol/L, 111 mmol/L and 90 mmol/L of sodium¹³. Evidence exist that sodium and glucose lower concentration is associated with increasing solute induced water absorption. Several studies, there after, have been conducted to develop reduced osmolarity ORS¹⁴.

In our study, patients treated with low osmolarity ORS shows more unscheduled fluid requirements as compared to patients treated with standard ORS (*p*= 0.000). Comparison in a similar way was also seen in trials by CHOICE study group 8 and Hahn *et al*¹⁵. Reduced osmolarity ORS showed significant beneficial effects in children as compared to WHO standard ORS. Reduced osmolarity ORS is associated with reduction

in need of unscheduled intravenous fluid infusion, decrease rehydration during stool output and lower number of patients with vomiting. Studies reported that reduced osmolarity ORS treated patients are at lower risk of developing hyponatraemia as compared to standard ORS^{16,17}.

Santosham *et al*, reported that reduced osmolarity ORS is significantly associated with positive impact on clinical course of acute diarrhea in terms of reducing stool output and reduction in proportion of vomiting (rehydration phase) and less requirement of supplemental intravenous therapy. They also showed evident findings with osmolarity ORS with severe non cholera diarrhea¹⁸. Kim *et al*, reported few unscheduled infusions and small stool volume with out any risk factors of developing hyponatraemia with reduced osmolarity ORS as compared to standard ORS¹⁹.

Detailed study on this subject doesn't exist. So far only one study on this subject was done in mayo hospital Lahore. Our results were inconsistent with this study²⁰. For >25 years, WHO and UNICEF have recommended a single formulation of glucose based ORS for prevention and treatment of diarrheal dehydration. Now, UNICEF has favored the use of reduced osmolarity ORS because of lower content of sodium and glucose in the solution. Researchers have found the use of low osmolar ORS is effective and safe in the management of AWD.

CONCLUSION

Incidence of or need of, unscheduled I/V fluid in children treated with low osmolar ORS is less as compare to standard ORS for management of acute diarrhea with some dehydration. And hence low osmolar ORS shows better acceptance in management of acute diarrhea.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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