RICE-ORS VERSUS GLUCOSE-ORS IN NON-CHOLERA DIARRHEA IN CHILDREN

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ABSTRACT

Background: Acute watery diarrhea (AWD) is the occurrence of ≥ 3 loose stools over a span of 24 hours, or a frequency that exceeds the individual's normal pattern.[1] In children, it continues to be a major contributor to both illness and loss of life in many developing nations,.[2] Around 9% of childhood deaths are associated with AWD, this makes it the second highest reason of death among children globally.

Objective: To compare the mean reduction in frequency of stool with use of rice-ORS versus glucose-ORS in non-cholera acute diarrhea in children.

Methods: This randomized clinical trial was carried out in Pediatric Department of King Edward Medical University/ Mayo Hospital Lahore from January to July 2020. Total of 80 patients (40 in each group) were enrolled by simple random sampling and were randomized into group-A (Rice-ORS) and group-B (Glucose-ORS). Age and change in number of stools were compared using Mann-Whitney U test in both groups (Glucose-ORS and Rice-ORS) as data was not normal (Shapiro-Wilk test was used). Chi-square test was utilized to assess the association between the gender and duration of diarrhea across both groups. A p-value of ≤ 0.05 was regarded as threshold for statistical significance.

Results: The mean age of patients was 5.94 ± 3.80 years and 4.66 ± 3.11 years in rice-ORS group and glucose-ORS respectively. Mean change in number of stool was 1.92 ±0.83 in group-A and 2.87 ± 0.82 in group-B. Group B showed a significantly higher mean change in stool frequency compared to Group A. (p-value < 0.001).

Conclusion: Glucose- ORS is more effective than the rice- ORS in alleviating the number of stools in non-cholera acute diarrhea in children.

Key Words Oral rehydration salt, Rice based ORS, Glucose ORS, Non-cholera, Acute watery diarrhea.

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INTRODUCTION

Acute watery diarrhea (AWD) is the occurrence of ≥ 3 loose stools over a span of 24 hours, or a frequency that exceeds the individual's normal pattern.[1] In children, it continues to be a major contributor to both illness and loss of life in many developing nations,.[2] Around 9% of childhood deaths are associated with AWD, this makes it the second highest reason of death among children globally.[3] Globally, there are approximately seventeen hundred million cases of AWD annually . In Pakistan, each child experiences five to six bouts of AWD within a year on average. Pakistan's prevalence of AWD was found to be 19% in the Pakistan Demographic and Health Survey 2017–18.[4]

Dehydration is the commonest complication of AWD that can be avoided by administrations of oral rehydration salt (ORS) solution.[5] Approximately

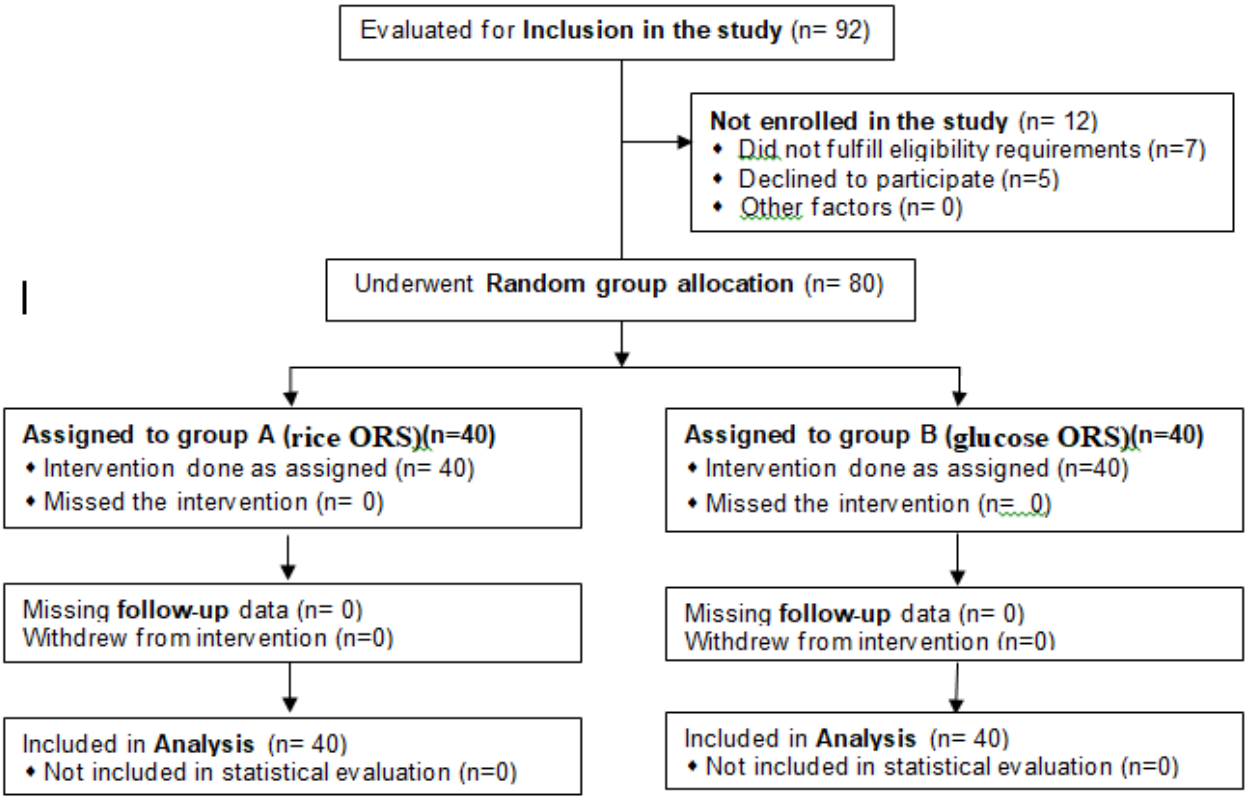
79.7% children shows improvement on oral rehydration therapy in terms of adequate hydration and reduced diarrhea.[6] Oral rehydration has proven to be comparable to the intravenous rehydration in re-gaining weight, shortening the length of diarrhea, and maintaining adequate hydration. Additionally, it is also associated with shorter stays at hospitals according to previous studies. [7]

The substitution of glucose with rice powder in the ORS has been studied, grounded in the idea that rice starch is broken down with the action of salivary and pancreatic amylase into polymers of glucose. These polymers are then broken down by brush border-glucosidases into glucose, thereby improving sodium and water absorption via sodium-dependent active transport. In previous trials, researchers have generated variable evidences. Kianmehr et al[8] found rice-ORS better than glucose ORS in reducing the stool output frequency whereas Guiraldes[9] found no difference in rice-ORS and glucose-ORS in non-cholera diarrhea. Therefore, to fill this knowledge gap, this study was planned to compare the mean reduction in frequency of stool with the administration of rice- ORS versus glucose-ORS in non-cholera acute diarrhea in children. This was hypothesized that there is some difference in the mean change in frequency of stool in rice-based ORS group versus glucose-ORS group.

METHODS

This randomized clinical trial was carried out in Pediatric Department of King Edward Medical University/ Mayo Hospital Lahore from January to July 2020. The research ethics review board of King Edward Medical University, Lahore, granted approval for the study. Parental informed consent was acquired. Total of 80 patients (40 in each group) were recruited (based on an 80% study power, a 95% confidence level, and the anticipated mean stool frequency at 48 hours as 2.80 ± 0.76 in rice-based ORS group and 2.18 ± 0.60 in glucose ORS group used for sample size estimation)[8] via non-probability consecutive sampling. Children of both genders, aged 3 months to 12 years, presenting with acute watery diarrhea (characterized by the occurrence of ≥ 3 stools over a span of 24 hours with consistency grade III or more of total duration for less than 14 days[1]) were included. Children having vibrio cholera on stool examination, 3rd degree malnutrition (Z-score < -3), severe dehydration, systemic infection, blood in stools and history of intravenous fluids administration within the 24 hours prior to admission were excluded from study.

Figure I: A flowchart based on the CONSORT guidelines



The children found suitable by inclusion criteria were randomized into group-A (rice-based ORS) and group-B (glucose-ORS) by lottery method. (Rice based ORS composition: 70 mEq of sodium, 20 mEq of potassium, 10 mEq of citrate, and 60 mEq of chloride.; Glucose based ORS composition: 3.5 g of sodium chloride, 1.5 g of potassium chloride, 2.9 g of sodium citrate, and 20.0 g of anhydrous dextrose). Children were given ORS according to weight and degree of dehydration. After 48 hours, children in both groups were re-evaluated to assess the change in stool frequency. Patients were followed in diarrhea ward by researcher himself. All data were documented using a structured questionnaire. Outcome was measured at 48 hours in term of mean number of change in stool. (Figure I)

All data was compiled and analyzed by employing the SPSS version 24. Age and change in number of stools, as continuous variables, were reported as mean ± SD and median ± IQR Categorical data like gender (male and female) and duration of diarrhea at admission (3-6 hours, 6.1-9 hours and > 9 hours) was presented as frequency (%). Age and change in number of stools were compared using Mann-Whitney U test in both groups (glucose ORS and rice-based ORS) as data was not normal (Shapiro-Wilk test was used and p-value was < 0.05 for both age and change in number of stool). Chi-square test was applied to compare gender (male and female) and duration of diarrhea at admission (3-6 hours, 6.1-9 hours and > 9 hours) in both groups (glucose ORS and rice-based ORS). A p-value of ≤ 0.05 was regarded as threshold for statistical significance.

RESULTS

The mean age of patients was 5.94 ± 3.80 years and 4.66 ± 3.11 years in rice-ORS group and glucose-ORS respectively. Group A consisted of 19(47.5%) male and 21(52.5%) females while Group B included 17(42.5%) male and 23(57.5%) female cases. The mean change in number of stool in group-A was 1.92 ±0.83 and in group-B it was 2.87 ± 0.82 respectively. Group B showed a significantly higher mean change in stool frequency compared to Group A (p-value < 0.001).

Table I: Comparison of mean change in frequency of stool with use of rice-ORS and glucose-ORS (n=80)

Variable		Glucose ORS	Rice based ORS	p-value
Gender	*Male*	17(42.5%)	19(47.5%)	0.653[a]
	Female	23(57.5%)	21(52.5%)	
Age (years)	*Mean*	4.66	5.94	0.168 [b]
	S.D	3.11	3.80	
	Median	4	5.5	
	IQR	5	7.5	
Duration of diarrhea at admission (hours)	*3-6 hours*	12(30%)	15(37.5%)	0.47 [a]
	6.1-9 hours	15(37.5%)	10(25%)	
	>9 hours	13(32.5%)	15(37.5%)	
Change in number of stools	*Mean*	2.87	1.92	<0.001 [b]
	S.D	0.82	0.82	
	Median	3	2	
	IQR	2	2	

(a.Chi-square test applied for categorical variables; b. Mann–Whitney U test used for non-parametric continuous variables.)

DISCUSSION

In the present study, glucose-based ORS proved more effective than rice-based ORS in decreasing stool frequency among children suffering from acute watery diarrhea. This was in contrast to the study of Kianmehr et al[8] which established that rice-based ORS decreases the stool frequency more than glucose ORS. Gregorio GV[10] also found that rice-based ORS demonstrates benefits over glucose-based ORS. However, Guiraldes et al[9] concluded that the rice-ORS is no more efficacious than glucose-ORS for managing watery non-cholera dehydrating diarrhea. Studies by Hossain MS[11] and Iftikhar S[12] showed no difference in stool output between the glucose-ORS group and the rice-ORS group. This discrepancy may be attributed to variations in the type or quantity of rice used across different studies. The exclusion of cholera patients may also be an important contributory factor in our study results.

The systematic review of sixteen studies by Mangahas MM et al [13] established that when rice-ORS was used instead of glucose-ORS, the length of acute diarrhoea was reduced by 5 hours and the stool output by 62.35 mL/kg. The only reported side effect was vomiting.

Molina et al[14] compared three types of ORS and found that during the initial six hours of treatment, children receiving rice flour-based ORS exhibited a 24% to 27% decrease in stool output compared to those given glucose-based ORS or rice dextrin-ORS. However, the results were different beyond the 12 hours of therapy. Given the small magnitude and short duration of this difference, the authors concluded that all three solutions demonstrated comparable efficacy in managing dehydration in acute watery diarrhea in children.

A limitation of the study was that the sample comprised children from a single hospital and was collected during a specific season, which may limit the generalizability of the findings. Thus, carrying out a multicenter study over span of whole four seasons is recommended.

CONCLUSION

Glucose- ORS is more effective than the rice- ORS in alleviating the number of stools in non-cholera acute diarrhea in children.

ETHICAL APPROVAL

Ethical approval of article was granted by the Institutional Review Board of King Edward Medical University vide reference No. 199/RC/KEMU dated 10 July, 2016.

AUTHOR'S CONTRIBUTIONS

MUA: Manuscript writing, data collection

MFA: Conception & design of the study, data analysis, manuscript writing, critical review

HN: Manuscript writing, data analysis, critical review

All Authors: Approval of the final version of the manuscript to be published

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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