

# COMMERCIAL ORAL REHYDRATION SOLUTIONS—PITFALLS, KNOWLEDGE, ATTITUDE AND PRACTICES

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## ABSTRACT

*Locally available commercial preparations of oral rehydration solutions (ORS) were analyzed for their composition, package instructions and availability. A survey from 50 chemist stores, revealed that ORS packets available belonged to 28 different pharmaceutical companies. None of the shops stored more than five different brands and alternate preparations were handed over the counter freely.*

*Only 48% of the available ORS formulations had the WHO recommended composition. In about one-fourth preparations, the sodium concentration was 30 mEq or less per litre. Fortyone per cent solutions had glucose concentrations more than 2%. The glucose and sodium ration of 1:1 was maintained in only 48% of the formulae. Bicarbonate and citrate both were used with almost equal frequency in these preparations. Cost, flavor, additional ingredients and package instructions varied widely in different packets. ORS formulations most commonly found in the drug stores had low sodium and high glucose concentration.*

*The attitude of doctors and nurses of Pediatric Department and Chemists towards commercial ORS was also studied. While 92% doctors were aware about WHO-ORS, none of the chemists and only 4% nurses had this awareness. All the respondents could remember only up to 3 or 4 brand names and except 30% doctors, none*

The utility of oral rehydration therapy in pediatric practice is now well established. The World Health Organization (WHO) recommended a universal oral rehydrating solution (ORS) to minimize the logistic problems associated with ORS production, distribution and proper case management. However, according to the latest statistics, the reported ORS supply would be sufficient to provide rehydration therapy for only 10% of all cases of childhood diarrhea that develop dehydration(1). The need for increasing the ORS production, is therefore obvious, and commercialisation of production is one possible solution.

By the end of 1989, 460 manufacturers of ORS or similar products indicated for rehydration were identified by the Diarrheal Disease Control Programme of the WHO(1). These products are promoted under almost 200 different brand names, and about 80% of them conform to composition recommended by the WHO. One reason for this development is that WHO and UNICEF purchase only the standard

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*were aware about the composition of those brands of ORS. Regarding importance of composition, preparations and precautions, practically nobody was up to the mark, but doctors were definitely better as compared to nurses and chemists.*

**Key words:** Oral rehydration solution, Acute diarrhea, Dehydration, Commercial ORS.

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formula of ORS. This has exerted some influence on manufacturers to conform to the WHO specifications. However, some of the most widely used products (e.g., in India) still do not correspond to the WHO recommended composition(1,2).

The rationale of a single solution has been doubted as the type of electrolyte losses in different types of diarrheal diseases is different(3). Also there is concern about the risk of hypernatremia with the use of sodium in concentration of 90 mEq/L in young infants due to immature renal concentrating capacity(4). Pharmaceutical industries taking advantage of these controversies have marketed a number of formulations with different concentrations and different methodology of preparation(5), creating confusion both amongst the prescribers and dispensers.

Abnormal contents of sodium and glucose in the ORS can be hazardous for the dehydrated child. Too high a sodium content may be associated with excessive sodium retention and its attendant complications, conversely a low sodium content could delay optimal fluid and electrolyte balance. A high glucose content by virtue of its osmotic activity, would act as a 'dehydrating' rather than 'rehydrating' solution(6).

The present study is an attempt to find out the extent of variation in composition of available commercial ORS and to evaluate the knowledge and attitude towards commercial ORS of the prime prescribers and dispensers (i.e., doctor, nurses and chemists).

### Material and Methods

Various commercial ORS were procured from randomly selected fifty chemist shops. The details regarding contents, package size, labelling, flavor, prices and

availability of these were recorded and analyzed. In approximately 60% brands, the contents were written as % w/w thus the concentration of various contents in terms of mEq/L or mmol/L had to be calculated.

The second phase of the study included assessment of knowledge, attitude and perception regarding ORS amongst medical profession. A preplanned questionnaire (open and closed ended) was prepared for this purpose. The questions pertained to preference of ORS; knowledge about home made ORS; awareness about WHO formula; commercial brands known, awareness about their contents, cost, flavor, dilution technique, etc.

Fifty qualified doctors (10-MD, 5 DCH, 35 MBBS) and an equal number of nurses working in the Pediatric Departments of Government Hospitals were interrogated in an anonymous manner and their answers were noted down in the proforma. Fifty chemists were also similarly interviewed. Only 20% chemists possessed the essential qualification (D. Pharma) for this profession. The qualifications in the remainder ranged from High School-20%, Intermediate 10% and B.A., and B.Com or B.Sc. 44%. The data obtained was analyzed using the  $\chi^2$  test.

### Results

None of the shops contained more than five different brands of commercial ORS. Data from the 33 ORS formulations marketed by 28 pharmaceutical companies are summarized in Table I-III.

*Presentation:* Two ORS formulations were marketed as 'ready to use' solutions in bottle. Other 31 forms were available as powder in packets/satchets to be reconstituted as per instructions before use. These

TABLE I—Composition of Commercial ORS

S.No.	Brand name	Na (mEq/L)	K (mEq/L)	Glucose (mmol/L)	HCO <sub>3</sub> (mEq/L)	Citrate mEq/L	Additional ingredient
<b>A. Resembling WHO Formulation</b>							
1.	Electral forte	90	20	111 (2)	—	30	—
2.	Electrobion	89.5	20.1	111 (2)	—	30	—
3.	Emlyte	90	20	111 (2)	30	—	—
4.	Emlyte S	90	20	111 (2)	30	—	Lactobacillus
5.	E-LITE	90	20	111 (2)	30	—	—
6.	GELYTE	90	20	111 (2)	30	—	—
7.	Leclyte W	90	20	111 (2)	30	—	—
8.	Orhydrate	90	20	111 (2)	30	—	—
9.	Punarjal	90	20	111 (2)	—	30	—
10.	Perkolyte	90	20	111 (2)	30	—	—
11.	Prolyte	90	20	111 (2)	30	—	—
12.	Relyte	90	20	111 (2)	30	—	—
13.	Speedoral	90	20	111 (2)	—	30	Glycine
14.	Sunitral	89.5	20.1	111 (2)	—	30	—
15.	Winhydran	90	20	111 (2)	—	30	—
16.	WHO-ORS	90	20	111 (2)	30	—	—
<b>B. Containing low sodium</b>							
17.	Apolyte	25	30	283(5.09)	—	15	Mg, Ca, Biphosphate
18.	Dextrolyte	25	25	414 (7.4)	18	—	Ca, Mg, Bactobacillus
19.	Emtral	25	25	q.s	—	15	—
20.	Floelectral	25	36	410 (7.4)	—	15	Mg, Ca, Biphosphate
21.	Prequest	25	25	396(7.13)	—	15	—
22.	Vijay Electrolyte	25	25	414 (7.4)	—	15	Mg, Biphosphate
23.	Leclyte	30	14.5	140 (2.5)	30	—	—
24.	Orolyte ready 'p'	30	20	278 (5)	30	—	—
25.	Pedialyte	30	20	277.7 (5)	—	—	Mg
26.	Peditral	50	20	188 (3.3)	20	—	—
27.	Beoral	52	25	—	—	33	Maltodextrin
28.	Electral	52	25	225 (4)	—	43	Ca, Mg, Biphosphate
29.	Sonolyte forte*	52	25	225 (4)	—	43	—
30.	Regolyte	60	20	404 (7.2)	11	—	—
31.	Replina K	60	20	187 (3.3)	25	—	—
32.	Lytolac	68	20	111 (2)	—	—	—
33.	Vitalyte	68.8	15	278.4 (5)	—	—	Vit C

\* Mentions that its formula corresponds to WHO recommendation.

Figures in parantheses indicate percentages

TABLE II—Commercial ORS Packing and Instructions

S. No.	Brand name	Packing (g)	Dilution instructions	Final concentration mentioned	Price/L	Flavor	
1.	+	Electrobion	5.7,28.5,85.5	5.7 gm in 200 cc	No	5.90	Orange
2.	+	Sunitral	5.7	1 Satchet/200 cc	No	7.50	Lemon
3.		Winhydran	5.85	1 Satchet/200 cc	No	7.50	Pineapple
4.		Punarjal	6.0	1 Satchet/200 cc	Yes	5.90	—
5.		Relyte	7.1	1 Satchet/250 cc	Yes	6.65	—
6.		Replina K	10,40	10 gm/250 cc	No	6.65	—
7.		Beoral	26	1 Satchet/200 cc	No	12.50	—
8.	‡	Geelyte	27.5	Whole pac/L	No	(Govt.supply)	—
9.	+*	Prolyte	27.5,55	1 MF/200 cc	Yes	5.61	Orange
10.	‡	E-Lite	27.5	Whole Pac/L	No	1.50	—
						(Govt.Supply)	
11.		Leclyte-W	27.5	2 TSF/200 cc	No	4.50	Orange
12.		WHO-ORS	27.5	1 Pac/L	No	3.55	—
13.		Orhydrate	28	1 Pac/L	Yes	—	—
14.		Leclyte	30	2 TSF/200 cc	No	6.80	—
15.	+*	Electoral forte	30	2 MF/100 cc	No	4.50	—
16.		Emlyte	35	1 TSF/125 cc	Yes	6.20	Pine apple
17.		Emlyte S	35	1 TSF/125 cc	Yes	7.09	Orange
18.	*	Speed oral	37.8	1 MF/100-200 cc	Yes	8.15	—
19.	*	Regolyte	40,80	3 MF/200 cc	No	9.58	—
20.		Peditral	10,40	40 g/L	Yes	7.03	Orange
21.		Prequest	40	1 TSF/50 cc	No	10.04	—
22.		Lytolac	50	40 g/500 cc		9.92	—
23.	+*	Electral	51.5	1 MF/100 cc	No	6.25	—
24.	+*	Sonolyte forte	51.5	2 MF/100 cc	No	6.20	Orange
25.	*	Dextrolyte	51.5	1 MF/50 cc	No	6.50	—
26.	*	Apolyte Plus	56	2 MF/100 cc	No	6.00	—
27.		Vitalyte	56	1 TSF/100 cc	No	5.55	—
28.		Perkolyte	70	1 TSF/25 cc	No	7.00	—
29.	*	Emtral	80	1 MF/50 cc	No	6.50	—
30.	*	Floelectral	80	1 MF/50 cc	No	7.00	—
31.	*	Vijay electrolyte	80	1 MF/50 cc	No	6.00	—
32.		Orolyte ready					
		'P'	200 cc	Ready made solutions		30.25	Palatable
33.		Pedialyte	250 cc			60.00	Coconut

MF = Measureful \* Measures provided + Pictorial demonstration ‡ Provides 2 small packs  
 † dilution depends on degree of dehydration.

TABLE III—Availability of Commercial ORS (N = 50)

S. No.	Brand name	Company (out of 50 shops)	Availability	Percentage
1.	Electral	F.D.C.	50	100
2.	Electrobion	E. Merck	36	72
3.	Speedoral	Roussel	21	42
4.	Winhydran	Winthrop	20	40
5.	Peditral	Searle	19	38
6.	Prolyte	Cipla	15	30
7.	Electral forte	F.D.C.	11	22
8.	Emlyte S	M.M. Labs	9	18
9.	Emtral	Emcure	9	18
10.	Emlyte	M.M. Labs	9	18
11.	Prequest	Parke-Davis	9	18
12.	Relyte	Rallis India	9	18
13.	Regolyte	Raptakos Brett & Co	8	16
14.	Punarjal	F.D.C.	4	8
15.	Sunitral	Sunita Pharm. in collaboration with E. Merck	4	8
16.	Pedialyte	Arbott	3	6
17.	Orolyte ready 'P'	Mount Mettur	3	6
18.	Beoral	Anand Synthochem	3	6
19.	Dextrolyte	Parke Davis	3	6
20.	Leclyte	Albert David	3	6
21.	Leclyte W	Albert David	3	6
22.	Perkolyte	Perk	1	2
23.	Floelectral	Flora Pharma Pvt.	1	2
24.	Lytolac	Biological E Ltd.	1	2
25.	Apolyte plus	Apolo Pharma Lab	1	2
26.	Raplina K		1	2
27.	Orhydrate		1	2
28.	Sonolyte forte	Soniko	1	2
29.	Vijay Electrolyte	Vijay Pharmaceutical	1	2
30.	Vitalyte	Pharma Continental	1	2
31.	E-Lite	EVLYN Lab	Govt. Supplies	
32.	Geelyte	GHIPO Lab		
33.	WHO-ORS	Ajanta Pharma		

varied greatly in color of packing, packet size and amount of powder (5.7 g/satchet to 85.5 g/packet). Some companies (F.D.C., M.M. Labs, Albert David) marketed different formulations by various brand names. In two commercial forms (E-Lite, Geelyte) each packet contained 2 small packets to be mixed before reconstitution. However, the constituents of each packet were not mentioned on the label, nor did the doctors using it knew about it.

*Sodium (Na):* Sixteen (48.5%) brands had sodium concentration of 90 mEq/L (WHO-recommended) while 17 (51.5%) had low sodium (25-70 mEq/L).

*Glucose:* Glucose concentration of 111 mmol/L (2%) was maintained in only 17 (51%) brands. In others, glucose concentration ranged from 140 (2.5%) to as high as 414 mmol/L (7.4%). The most popularly marketed ORS (Electral) had a glucose concentration of 225 mmol/L (4%). The 1:1 Na:glucose ratio was maintained in only 48% brands; in 52% brands it ranged from 1:3 to 1:16. In one brand (Beoral), maltodextrin was incorporated in place of glucose.

*Base:* Half the formulations used bicarbonate while the other half used citrate as base. In comparison to a standard concentration of 30 mEq/L for both bicarbonate and citrate by WHO, it ranged from 11 to 30 mEq/L for bicarbonate and 15 to 43 mEq/L of citrate in various commercial ORS.

*Potassium (K):* The potassium concentration in various formulations ranged from 14.5 mEq/L to 36 mEq/L. All the brands which had potassium concentration more than 20 mEq/L also had a high glucose content.

*Additional ingredients:* Lactobacillus,

glycine, sulphate, biphosphate, Vitamin C, calcium and magnesium appeared as additional ingredients in 30% of the formulations.

Thus only 42.4% of the commercial brands strictly adhered to the WHO recommendations.

*Flavor:* Seventy per cent of ORS made no mention regarding flavor. The remaining were flavored with orange, pineapple, lemon or coconut.

*Cost:* The price varied from Rs. 1.50 to 12.50/L for packets and Rs. 30-60/L for ready made solutions. The commonly used and available ORS cost between Rs. 6-10/L to the patient.

*Instructions:* While all available forms had instructions in English, none of them contained instructions in Hindi or local language except two (E-Lite and Electral).

*Pictorial demonstration:* This was seen in only 18% of brands, that too for the name sake as none was clear or informative.

*Measuring scoops:* These were provided in only 33% of formulations and they varied greatly in their size and capacity.

*Instructions for reconstitution:* These were variable like 1 TSF/50, 100 or 125 cc; 2 TSF/200 cc; 1 measureful (MF)/50 cc, 100 cc; 3 MF/200 cc, 1 satchet/200 cc or 250 cc, 1 pac/L or 3 L. One formulation even recommended different composition according to the degree of dehydration (Speedoral).

*Availability:* Electral was available in all the shops followed by Electro-bion, Speedoral and Winhydran which were available on 72, 42 and 40% of shops, respectively. The other commercial forms

TABLE IV—*Knowledge and Attitude About Commercial ORS*

Questions asked	Reply			p value
	Doctors (50)	Nurse (50)	Chemist (50)	
<b>Preference of ORS</b>				
Commercial form	25	10	48	A <0.003
Home made	25	40	2	B <0.0001
				C <0.0001
<b>Knowledge about home made ORS</b>				
Correct	40	10	0	A <0.0001
Wrong	10	40	50	B <0.0006
				C <0.0001
<b>Awareness about WHO-ORS</b>				
Aware	46	2	0	A <0.0001
Not aware	4	48	50	B <0.25
				C <0.0001
<b>Number of commercial forms of ORS known</b>				
1-3	35	50	8	A <0.0001
4-6	13	0	28	B <0.0001
> 6	2	0	14	C <0.0001
<b>How many known commercial forms correspond to WHO-ORS</b>				
Aware	15	0	0	A <0.0001
Not aware	35	50	50	B NS
				C <0.0001
<b>Are all the commercial ORS nearly same in their contents*</b>				
Yes	35	35	37	A ]
No	15	15	13	B ] NS
				C ]
<b>Commercial form recommended</b>				
Any	4	31	47	A <0.0001
Specific	46	19	3	B <0.0001
				C <0.0001
<b>Awareness about cost of ORS</b>				
Correct	16	19	50	A 0.34
Wrong	34	31	0	B <0.0001
				C <0.0001
<b>Type of water to be used for reconstituting ORS</b>				
Boiled/cooled	37	43	38	A ]
Tap water	13	7	12	B ] NS
				C ]

(Contd.)

TABLE IV (Contd.)

Questions asked	Reply			p value
	Doctors (50)	Nurse (50)	Chemist (50)	
Amount of ORS to be prepared at one time				
One glass	50	44	37	A <0.013
One litre	0	6	13	B <0.062 C <0.0001
Amount of salt that should be added to one glass of water				
1 TSF	2	2	17	A NS
1 MF	2	8	25	B <0.0001
As per instruction	46	40	8	C <0.0001
Does any increase or decrease of Na or glucose in ORS have any affect on diarrhea				
Yes	38	0	0	A <0.0001
No	12	0	0	B NS
Not aware	0	50	50	C <0.0001

NS = No significant

\* = Most of those who answered 'No' could not tell the difference

+ = A few of the chemists felt that ORS should ideally be prepared in ice cold water

‡ = A few nurses and chemists opined that Glucose C or D are also good ORS

A = 'p' value between doctors and nurses

B = 'p' value between nurses and chemists

C = 'p' value between doctors and chemists.

were available in less than one-third of shops. In majority of shops, only 2-4 brands were available.

The knowledge and perception of doctors, nurses and chemists are summarized in Table IV.

*Preference for commercial ORS:* While 96% of chemists and 50% of doctors showed preference for commercial ORS, 80% nurses preferred home made preparation, despite lacking correct knowledge about it.

*Awareness about WHO ORS formula-tion:* 92% of doctors were aware of WHO-

ORS formula but surprisingly 96% of nurses and 100% of the chemists had no knowledge about WHO-ORS.

*Brand names remembered:* Although knowing that many commercial brands are available in the market, 68% of doctors and 100% of nurses did not know more than 3 brand names. Even 68% of the chemists could not recollect more than 6 brand names. A majority of them were not aware of the exact composition of the brands they were familiar with.

*Awareness about composition:* Only 30% of doctors (most of them postgradu-



ates or doing postgraduation) were aware of the commercial forms corresponding to WHO-ORS. None of the nurses or chemists was aware about it; as a guess they all said—probably Electral.

*Awareness about contents:* Two-thirds of the doctors, nurses and chemists felt that there was not much difference in the contents of various formulations. They just differed in their flavor and cost. One-third of those who felt that some difference definitely existed were not aware about the difference, except doctors.

*Commercial form recommended:* Ninety two per cent of doctors preferred to prescribe specific brand name while 62% of nurses and 94% of chemists felt that a patient could take any commercial formulation. Among the specific form recommended, electral was the commonest favoured by all chemists and nurses and 46% of doctors. Everybody felt that ideally the patients should get the prescribed form but only 6-10% of doctors, nurses and chemists checked it. If the prescribed preparation was not available, an alternate form was acceptable to all. Only 56% of doctors would only accept it if it matched the contents of their prescribed form or resembled WHO formulation, while it did not matter much for the nurses and chemists.

*Awareness about cost:* Almost two-thirds of the doctors and nurses were not aware about the exact cost of ORS they were prescribing.

*Water to be used for reconstitution:* Seventy four per cent of doctors, 86% of nurses and 76% of chemists were in favour of using boiled cooled water for reconstituting the ORS packets, rest favoured fresh tap water. A few chemists were of the opinion that ice cold water

should be used for it.

*Amount to be prepared:* All categories preferred to prepare one glass of ORS at one time rather than full one litre. Regarding amount of powder (ORS) to be used for one glass of water 80-90% of doctors and nurses answered it should be according to instructions given on packing, it was reverse with the chemists who felt TSF or measureful (MF) should be used to decide the amount of ORS.

*Effect of composition of ORS on dehydration:* 86% of doctors were aware that high or low sodium/glucose in ORS adversely effects rehydration but none of the nurses or chemists was aware about it ( $p < 0.001$ ).

*Most commonly marketed ORS:* Electral was undoubtedly the most common commercial form sold. This was attributed to its being the oldest and most popular brand by 84% doctors, 70% of nurses and 36% of chemists. All of the chemists agreed that it also had a good margin of profit. Its having a better taste as compared to other forms was felt by 30% of nurses, 6% doctors and 10% chemists.

## Discussion

The use of glucose-electrolyte solution has revolutionized the management of acute diarrhoea. The estimated requirements of the ORS packets are very high. There are about 500 million episodes of diarrhoea (population based 1980) in all age group or nearly 300 million episodes amongst 140 million under five children (2 episodes/child/year). About 10% of these are likely to be dehydrated. Thus considering that rehydration will be required for 50 million episodes, needs for ORS packets will be above 100 million. However, the ac-

tual requirement may be lesser, as it might not be possible to make packets available to all those who need it due to various constraints(7,8). Pharmaceutical industries have made a useful contribution towards the national effort of the Government and other non-Government agencies for production, popularisation and extensive use of ORT in the community by marketing ORS packets(9). The concentration of sodium in ORS has been a matter of controversy. While use of WHO-ORS with sodium concentration of 90 mEq/L (based on sodium loss in cholera cases) has been found satisfactory both for rehydration and maintenance with certain guidelines(10-15), there are occasional reports of complications due to hypernatremia(3,16). As sodium loss in majority of childhood diarrhea is low, a solution with sodium content of 50-60 mEq/L has been suggested both for rehydration and maintenance of hydration(17,18). Amongst marketed ORS packets, 52% are in the low sodium category but alarmingly in 27%, sodium concentration is 30 mEq or less/L. The solutions in the latter category are likely to lead to water toxicity and overhydration with severe hyponatremia.

Another important aspect of the ORS component not often realized is the concentration of glucose. It has been observed that maximum water absorption occurs with glucose concentration between 80-140 mmol(19,20) and glucose and sodium are absorbed at close to 1:1 molecular ratio(21,22). Thus oral rehydration solutions having sodium concentration of 90 mEq/L and 50 mEq/L should have a glucose content of 2 per cent and 1 per cent, respectively. Higher glucose concentration in ORS is associated with osmotic fluid flow in the intestine and exacerbation of diarrhea thus further aggravating the dehydra-

tion(6,10,23,24). It is shocking that in over half the marketed ORS preparations, there is scant regard for appropriate glucose concentration. 36% have glucose concentration equal to or above 4% and in low sodium ORS preparations ratio of sodium and glucose is as high as 1:16.

It is possible that the solutions have been made sweeter to increase palatability, thus increasing acceptability leading to higher sale and profitability. Such brands could be a cause of dehydration rather than rehydration and have therefore aptly been termed as "Sweet Killers"(24). It is obvious that the pharmaceutical industry in its endeavour for competitiveness and trying to market something unique for their product have unnecessarily increased the cost and in fact spend a lot in their promotion.

Twenty seven per cent of commercial formulations have potassium more than 20 mEq/L. Although it has been felt that the concentration of K recommended in WHO ORS is less than the losses in the stools, i.e., 27-38 mEq/L(10), the ideal concentration of potassium in ORS has not been formally evaluated (25). Using excess level of potassium in ORS could not only be dangerous for those with compromised renal function but also make the preparation bitter(10).

Ca, Mg, sulphate, phosphate, etc. although lost in small quantities in diarrheal stools are not associated with clinical manifestations(10). Their addition apart from increasing the cost of the resulting formulations also increases the molarity making the solution hyperosmolar. Similarly, taste is not a problem in children who are dehydrated and unflavored ORS tasting like tears are acceptable to almost all infant(26). Flavoured ORS apart from increasing the cost, also do not have a universal taste appeal, at the same time they also

have a theoretical disadvantage of over-consumption and hypernatremia(19).

The present study highlights that although 32 ORS brands are available in the market, not more than 5 brands are available on one shop. The medical professionals usually do not remember more than 5 brand names. Approximately half of the commercial formulations, not corresponding to the WHO recommendations in their contents are the ones which are available in majority of the chemist shops and are being sold unchecked all over the country(9,24,27).

As 80% of Pharmacists are unqualified and almost 100% are not aware of WHO-ORS they sell an alternate products of ORS not realizing the subtle differences in concentrations of ingredients and recommendations for preparation of solution predisposing the children to iatrogenic complications. The variation in the contents, packing, flavor, price, instructions for reconstitution is so wide that even the most

meticulous physician or health functionary may commit a mistake in giving the correct instructions.

The pitfalls of the commercial ORS as summarized in *Table V*, can be obviated by: (a) A standard formulation with a single brand of ORS, e.g., ORS—Name of Company; (b) Compulsory inclusion of pictorial demonstrations and instructions for preparation in local language, Hindi and English, along with precautionary measures suggested by the WHO on each packet (c) Maintaining a uniform appropriate size of ORS packet so that measures and TSF could be detected.

It is concluded that very few brands completely adhere to the WHO formulation and variability in contents is frequent, sometimes reaching dangerous proportions. The knowledge, attitude and perception of various prescribers (including qualified doctors) and dispensers on this topic is appalling. The need for urgent remedial action is obvious.

TABLE V—*The Pitfalls of Commercial ORS*

1.	Variable sodium content	25 – 90	mEq/L
2.	Variable potassium content	20 – 36	mEq/L
3.	Variable glucose content	111 – 414	mmol/L
4.	Variable sodium : glucose ratio	1:1 – 1:16	
5.	Concentration not printed in terms of mEq/L, mmol/L in most brands.		
6.	Final concentration of mixed solution are often not printed.		
7.	Additional ingredients are variable and unnecessary.		
8.	Variable cost.		
9.	Confusing packing and instructions for dilution.		
10.	Precautionary measures suggested by WHO have not been printed.		
11.	Local language not used on packets.		
12.	Pictorial instructions are usually missing and if given it is not informative.		

## REFERENCES

1. Programme for Control of Diarrheal Diseases. Seventh Program Report 1988-89 WHO/CDD/90. 30, pp 16-19.
2. Mehta MN. ORT-current concepts, problems and solution *In: Proceedings of Symposium on ORT in Infants and Children*. Ed. PGIMER, Chandigarh, 1990, 10-22.
3. Finberg L. The role of oral electrolyte-glucose solutions in hydration of children. *International and domestic aspects*. J Pediatr 1980, 96: 51-54.
4. Bhargava SK, Sachdev HPS, Das Gupta B, Man Mohan, Singh HP, Daral TS. Oral therapy of neonates and young infants with WHO rehydration packets: A controlled trial of two sets of instructions. *J Pediatr Gastroenterol Nutr* 1986, 5: 416-422.
5. Workshop on Standardisation of Commercial Oral Rehydration Formulation. *Indian Pediatr* 1984, 22: 555-561.
6. Tiwari DK. Oral rehydration solution or oral dehydration solution. *In: Proceedings of Symposium on ORT in Infants and Children*. Ed. Mehta S. Chandigarh, PGIMER 1990, pp 27-30.
7. National Diarrhoeal Diseases Control Programme. Management of Acute Diarrhea. NICED (ICMR) 1985, pp 1.
8. Oral Rehydration Salts, Planning, Establishments and Operation of Production Facilities. WHO/CDD/SER/85.8, pp 5-17.
9. Ghai OP, Bhan MK. Complications of commercial rehydration packets. *Indian Pediatr* 1984, 21: 591-593.
10. Sobti J. Why use WHO formula ORS? *Indian Med Assoc* 1989, 87: 291-292.
11. Molla AM, Rahman M, Sarkar SA, Sack DA, Molla A. Stool electrolyte content and purging rates in diarrhea caused by rotavirus, enterotoxigenic *E. coli* and *V. cholerae* in children. *J Pediatr* 1981, 96: 835-838.
12. The Management of Diarrhea and Use of ORT. A Joint WHO/UNICEF Statement Geneva. WHO 1983.
13. Kumar V. Oral rehydration therapy for diarrhea in children. *Indian Pediatr* 1980, 26: 739-743.
14. Nalin DR, Harland E, Ramlal A, *et al*. Comparison of low and high sodium and potassium content in oral rehydration solution. *J Pediatr* 1980, 97: 848-853.
15. Pizzaro D, Posada G, Villavicencio N, Mohs E, Levine MM. Routine treatment of hypernatremic and hyponatremic diarrheal dehydration in infants using an oral glucose/electrolyte solution containing 90 mmol/L sodium. *Am J Dis Child* 1983, 137: 730-734.
16. Aball AJ. Single solution not ideal for oral therapy in diarrhea. *Lancet* 1976, 2: 633-634.
17. Chatterjee A, Mahalanbis D Jalan *et al*. Oral rehydration in infantile diarrhea. Controlled trial of a low sodium glucose electrolyte solution. *Arch Dis Child* 1978, 53: 282-289.
18. Santosham M, Daum RS, Dillman L, *et al*. Oral rehydration therapy for infantile diarrhea: A controlled study of well nourished children hospitalized in the United States and Panama. *N Engl J Med* 1980; 97: 848-853.
19. Angela M, Graeme B. Oral rehydration in infantile diarrhea in the developed world. *Drugs* 1988, 36 (Suppl 4): 48-60.
20. Sladen GE, Dawson AH. Interrelationships between the absorption of glucose, sodium and water by the normal human jejunum. *Clin Sci* 1969, 36: 119-122.
21. Malawar SJ, Ewton M, Fordtran JS, Ingelfinger FJ. Interrelation between

- jejunal absorption of sodium, glucose and water in man J Clin Invest 1965, 44: 1072-1075.
22. Goldner AM, Schultz SK, Curran PF. Sodium and sugar fluxes across the mucosal border of the rabbit ileum. J Gen Physiol 1969, 53: 362-366.
  23. Recommendations: Composition of ORS. Indian Pediatr 1990, 27: 965-966.
  24. Tiwari DK. Sweet killers. Indian Pediatr 1990, 27: 510-511.
  25. Farthing MJG. History and rationale of oral rehydration and recent development in formulation of an optimal solution. Drugs 1988, 34 (Suppl 4): 80-90.
  26. Editorial. Oral therapy for acute diarrhea. Lancet 1978, ii, 300-301.
  27. Lionel J, Steinhoff MC, Percira SM. Commercial ORS and hypernatremia. Indian Pediatr 1984; 21: 595-599.

**Editor's Note:**

An attempt is being made to rationalize ORS composition in the country. The Ministry of Health & Family Welfare, Government of India, has recently issued instructions that Central and State Governments will procure and purchase ORS packets strictly conforming to the WHO formula which would be bearing the accompanying logo and instructions for use.

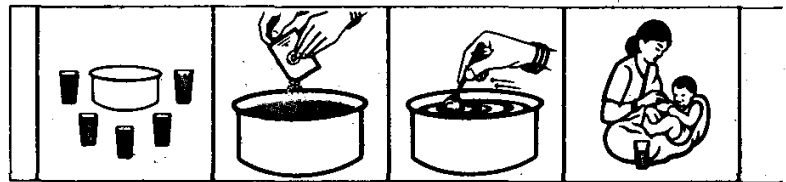


Mix entire contents of packet in one litre of water

पैकेट के पूरे बरतन को एक लीटर पानी में मिलाएँ.

**HOW TO MIX**

इसको कैसे मिलाया जाए



Pour five glasses of water  
पाँच गिलास पानी में

Mix ORS packet  
पूरे ओ.आर.एस. पैकेट को मिलाएँ

Stir till dissolved  
गुन घुने तक मिलाएँ

Give Solution to baby  
बच्चे को दार देना है

TO BE USED WITHIN 24 HOURS

२४ घंटों के अंदर इस्तेमाल करने का है

ORS to be given after each loose motion  
ओ आर एस हर बरत के बाद मिलाये

AGE	Below 2 years	50-100 ml (1/4 glass)	
उम्र	२ वर्ष से कम	५०-१०० मी. ली. (१/४ गिलास)	
	2 to 10 years	100-200 ml (1/2 glass)	
	२ वर्ष से १० वर्ष तक	१००-२०० मी. ली. (१/२ गिलास)	
	Above 10 years	As much as able to drink	
	१० वर्ष से अधिक	जितना पी सके	

Batch No.  
Mfg. Date  
Expiry Date  
M. R. P.

Mfg. lic. No.