Natural Salt Content of Water- Neglected Aspect of ORT

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The life saving role of oral rehydralion therapy (ORT) in case management of dehydrating diarrhea is now well established. After much research and trials, the WHO has recommended a standard ORS solution which contains 90 mmol/L of sodium, 20 mmol/L of potassium, 80 mmol/L of chloride, 30 mmol/L of bicarbonate (or 10 mmol/L of citrate) and 111 mmol/L of glucose. To accomplish this, final concentration of two variables must be considered: the quantity of salts and the volume of water in which these salts are dissolved. A significant break-through has been made in this direction by augmenting the supply of ORS in prepacked sachets to be dissolved in 1 litre of water under the Diarrheal Disease Control Programme. But, surprisingly, little attention has been paid to the natural salt content of water. This study was, therefore, carried out to detect the presence of sodium and potassium in ground water used for drinking purpose in rural central Rajasthan and to evaluate its effect over the final composition of ORS.

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Material and Methods

The study was undertaken in the month of December 1992 in 10 remote villages of Tehsil Shahpura, District Bhilwara (Rajasthan). Random samples of drinking water were obtained from these villages from the only source available in vicinity which was being regularly used by the people. Gross physical impurities were removed by filtering it through a thin cloth as was being done by the villagers. ORS solution was prepared by adding in one litre of each water sample, one sachet full of WHO-ORS containing 3.5 g of sodium chloride, 2.9 g of sodium citrate, 1.5 g of potassium chloride and 20 g of glucose, manufactured by Rajasthan Drugs and Pharmaceuticals Ltd. Control solution of ORS was prepared by using municipal water available in Ajmer. On the same day, all the samples which were collected in clear glass flasks, were transported to Ajmer where sodium and potassium concentrations were estimated with the help of "Flame Photometer" (Systronics-India).

Results

Out of the 10 test samples, 4 samples were obtained from the open wells while 6 were collected from the hand pumps. The majority (9/10) were brackish in taste. After making ORS solution, four of them became too salty to drink.

The sodium and potassium contents of the plain water samples as well as that of reconstituted ORS solutions are shown in *Table I.* The control sample was having traces of sodium while all the test samples were having some amount of it. Four samples contained sodium less than 10 mmol/L while sizeable concentration of it (45-80 mmol/L) was found in three samples. Rest of the samples were having

moderate amounts (15 to 25 mmol/L).

The control ORS was having 94 mmol/L of sodium. Two of the test ORS solutions had the desired sodium concentration of 90 mmol/L, while the samples with high natural sodium contents showed very high concentrations in ORS solutions also (160-190 mmol/L).

Although the control sample was potassium free, the test samples did show its presence (0.2 to 5.5 mmol/L). The control ORS solution had 18 mmol/L of potassium while test solutions contained it in the range of 18 to 25 mmol/L.

Discussion

The optimum concentration of sodium in ORS has been a matter of much debate. Although use of WIIO-ORS having 90 mmol/L of sodium has been found satisfactory both for rehydration and maintenance with certain guidelines(l,2), various trials have shown a definite risk of complications due to hypernatremia particularly in neonates and young infants(3,4). As sodium losses in majority of childhood diarrheas are low, a solution with sodium contents of 50-60 mmol/L has been suggested both for rehydration and maintenance of hydration(5).

While the sodium controversy remains unresolved and we continue to propagate the use of WIIO-ORS, another important aspect of the ORT, not yet realized, is the natural sodium contents of the solvent water. An obvious reason for this ignorance may be easy access to safe and potable drinking water available to majority of

TABLE I – *Sodium and Potassium Contents of Test Samples*

Name of villages	Source	Plain water			ORS solution		
		Taste	Na (mmol/L)	K (mmol/L)	Taste	Na (mmol/L)	K (mmol/L)
1. Control (Ajmer)	Municipal water	Nil	2	Nil	Salty	94	18
2. Doi-Ka Khera	Well	Salty	7	2.0	Very salty	127	19
3. Sarsunda	Hand-pump	Very salty	45	5.0	Unpalatable	168	25
4. Kanechhan Kalan	Well	Very salty	4	1.5	Unpalatable	120	19
5. Rajiyas	Hand-pump	Salty	15	Nil	Salty	129	22
6. Kothiya	Well	Salty	2	Nil	Salty	90	18
7. Ummedpura	Hand-pump	Very salty	30	0.2	Salty	162	18
8. Bhojpur	Hand-pump	Very salty	80	1.9	Unpalatable	190	22
9. Dhikola	Hand-pump	Salty	18	4.0	Very salty	125	23
10. Arwar	Hand-pump	Salty	4	1.2	Very salty	90	21
11. Shahpura	Well	Salty	25	5.5	Very salty	132	24

urban population. Salts of sodium and potassium may not be practically traceable in such water, and therefore, may not have drawn the attention of worthy workers in the field. However, about 80% of rural population of India does not have reasonable supply of such wholesome water(6). The situation is more critical in remote areas of Rajasthan where the locally available resources like wells and hand pumps are the only sources of drinking water. The brackish taste and hardness of the water samples obtained from these areas speak of its high calcium and magnesium contents(7). Under these situations arises a strong suspicion of high content of sodium also as most of the sodium salts are highly soluble in water. Sixty per cent of the water samples in the present study showed a significant quantity of sodium, half of which were in the alarmingly high range of 45 to 80 mmol/L. On making ORS solution in these samples, the eventual sodium concentration rose to the unacceptable limits of 160 to 190 mmol/L as against the desired concentration of 90 mmol/L. In clinical situations, such solutions not only pose threat of hypernatremia but also make the solution less acceptable. This may explain the usual complaints of refusal to drink or nausea and vomiting on offering such ORS solution to children, a problem so often encountered by the first author while working at the PHC. The maxim "Taste it, and don't give anything more salty than tears"(8) also does not seem to hold true here. There is a real fear of the condition getting grave during summer months when the presently available water sources may deplete fast and people may be forced to resort to even those sources which hitherto were considered non-potable and hence not included in the present study. Moreover, the incidence of diarrhea is also at its peak during the same season. Even the extensive review of available literature revealed complete dearth of data to throw any light on this relevant issue.

The concentration of potassium in samples of ORS solutions in the current study was within the acceptable range of 18 to 25 mmol/L as compared to standard 20 mmol/L.

The conclude, this brief communication is an attempt to highlight the importance of sodium content of water which is a vital but rather neglected aspect of ORT. The unpalatable taste and a real danger of hypernatremia occurring on consumption of ORS solution prepared in high sodium containing water may create realistic bottlenecks in successful implementation of National ORT Programme especially in certain geographical areas of the country like rural Rajasthan. More detailed and well controlled clinical trials based on this preliminary report are required before formulating any concrete recommendations.

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Right Atrial Thrombus Associated with Pyopericardium

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Myxomas and thrombi constitute the majority of a long list of right atrial masses detected on echocardiography(l). Free floating or adherent right atrial thrombi are seen either as a complication of deep vein thrombosis or as an iatrogenic complication of central venous catheters. Recently, we came across a child with a right atrial mass which disappeared after two days, making us believe that it was a thrombus. In addition, there was an associated pyogenic pericardia! effusion .This is an unusual association and has not been reported so far.

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Case Report

An 18-month-old boy, was admitted with fever, cough and breathlessness of one month duration. Inspite of treatment with varous antimicrobials, the response was inadequate. He had history of recurrent chest infections in the past. However, there was no history suggestive of congestive cardiac failure. On physical examination he was a sick child with heart rate of 100/min, respiratory rate 40/min and blood pressure 80/60 mm Hg. There was mild peripheral cyanosis, but no pallor or edema. The neck veins were engorged. Chest examination showed bilateral crepts, while in the CVS there was cardiomegaly and muffled heart sounds. There were no murmurs. Liver was palpable 8.5 cm below costal margin but there was no splenomegaly or ascites. Chest X-ray showed an enlarged cardiac silhouette. A provisional diagnosis of pericardial effusion was made. He was taken up for echocardiography which confirmed massive pericardial effusion.

In addition, a well defined round and