Evaluation of Commercial and Formulated Oral Rehydration Products

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Four millions children die annually due to diarrhoea and many others from causes that are aggravated by diarrhoea. An attempt was made to adopt Rice based Oral Rehydration Therapy (ORT) with a formulation of Rice. Oral Rehydration Salts (ORS) in tablet form. Commercially available ORS products are not in accordance with WHO-ORS formula, a wide variation in composition was observed. Analysis of marketed ORS reveals that the active constituents are within the label claim. Finally, the analysis of formulated Rice based ORS tablet reveals that the Sodium ion (Na^+) concentration, which causes hypernatremia in children, was less i.e., 60 mM from that of WHO formula of 90mM. This rice based ORS avoids the risk of hypernatremia and also reduces the stool volume and intensity of diarrhoea.

A quarter century after it was introduced to the world, Oral Rehydration Therapy (ORT) has indeed come a long way in short time and is now at a turning point.[1] ORT combined with guidance on appropriate feeding practices is the main strategy recommended by the WHO Diarrhoeal Diseases Control (DDC) programme to achieve a reduction in diarrhoea related mortality and malnutrition in children.[2] The present ORS formulations does not reduce the volume, frequency or the duration of diarrhoea. This raises the practical problem of its acceptance, since a major concern of mothers and health workers is to reduce the frequency and volume of the child's stool. This leads to the development of cereal or food based ORT.[3] Rice on hydrolysis yields glucose, aminoacids and oligopeptides, which enhances, sodium absorption through independent pathways. Also the slow release of glucose from starch will allow a larger quantity to be used with out any osmotic penality.[4]

Samples of ORS, which were made available to the hospitals through the Government medical stores and 5 commercial products were identified as suitable candidates for the present study. The estimation of samples for active constituents was done as per the procedures given in Pharmacopoeia of India.[5] The media analysis shows that treatment with rice solution reduces both the rate of stool loss and the duration of diarrhoea[6]. More recently, field studies with rice ORS solutions have indicated an appreciable advantage both for rapid recovery from diarrhoeia and improved nutritional status when cereal based solutions were used.[7]

The formula and composition are given in the **Table 1 & 2.**

Analysis of the marketed products revealed that 5 out of 13 deviated from WHO formula by incorporating additional colors and flavours. Interestingly a wide variation was also noticed in the contents of the essential constituents. Quantitative estimation by flame photometry indicated that the electrolyte contents were within the label claim.

Rice based ORS were formulated and evaluated and found that is offers several advantages. In our formulation, the concentration of Na^+ was kept at 55 mM, which is markedly lower than the Na^+ concentration (90 mM) recommended by WHO, because the high content of Na^+ was reported to cause hypernatremia in children because of immature excretory functions. A major disadvantage of ORS pow-

Table 1: Formulation of Rice based effervescent oral rehydration tablets

Constituents	Quality
Sodium chloride	1.5 g
Potassium chloride	1.5 g
Sodium bicarbonate	2.5 g
Citric acid	2.0 g
Rice powder (Boiled Rice)	20.0 g

Table 2

Composition	mM/L
Sodium (Na^+)	55.40
Potassium (K^+)	20.00
Bicarbonate (HCO_3^-)	30.00
Citrate	6.80
Chloride (Cl^-)	45.80

der form is the inconsistency in dosage. This dosage variation arises due to variations in the powder quantity that is used for making solution and leads to over dosage/under dosage. This disadvantage has been over come by formulating ORS into an effervescent tablet which represents unit dose of electrolyte. Finally formulation of ORS into a tablet also helps us to over come 'caking' on long storage which can be identified as yet another reason for dosage inconsistency. Evaluation of the formulated tablets revealed that the content of the essential electrolytes was well within the limits specified by I.P. (Table 3).

The main conclusions derived from the present study can be summarised as:

1. ORS constitutes the 'first line of therapy' for dehydration arising out of a variety of conditions like gastroenteritis, dysentery, diarrhoea, amoebiasis etc.
2. The supply of ORS to hospitals surveyed is regular and sufficient to meet the local demands.
3. The composition of many marketed ORS formulations show a wide variation from the formula recommended by WHO.
4. Quantitative estimation revealed that the content of the essential electrolytes in the marketed formulations were with in the lable claim.
5. A rice based ORS was successfully formulated in the form of an effervescent tablet, which offered significant advantages over the conventional powder form.
6. The content of the essential electrolytes in the tablet, we formulated, was found to be well within the I.P. limits.

Table 3: Estimation of active constituents in rice based 'ORS' tablets

Name of the Constituent	Lable claim (mOsm/L)	Estimated Value (mOsm/L)	% label Claim	I.P. Limit (%)
Sodium	55.40	53.80	97.11	90-110
Potassium	20.00	19.62	98.10	90-110
Bicarbonate	30.00	31.22	104.06	90-110
Citrate	6.80	6.56	96.47	90-110
Chlorides	45.80	46.18	100.82	90-110

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Extractive Spectrophotometric Determination of Phenothiazine Drugs with Chlorophenol Red

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A sensitive spectrophotometric method for the determination of chlorpromazine hydrochloride, promethazine hydrochloride, prochlorperazine maleate and trifluoperazine hydrochloride based on the formation of chloroform extractable complexes exhibiting maximum at 405 nm with chlorophenol red in acidic medium is described. A study of the effect of commonly associated excipients revealed that they did not interfere. Statistical analysis of the results indicates that the method is precise and accurate.

PHENOTHIAZINE drugs are used as antipsychotic, anticholinergic, antihistaminic and tranquilizers. Chlorpromazine hydrochloride (CPH), promethazine hydrochloride (PH), prochlorperazine maleate (PPM) and trifluoperazine hydrochloride (TFH) are official in B.P,[1] and U.S.P[2]. In view of their importance considerable work has been done for the determination of phenothiazine class of drugs as reviewed by Blazek **et al**[3] and Fairbrother.[4] Spectrophotometric[5,6], spectrofluorimetric,[7] polarographic[8] and chromatographic[9] methods are reported in the literature. The proposed extractive spectrophotometric method for the determination of phenothiazine drugs is based on the formation of complexes with chlorophenol red and these complexes are quantitatively extracted into chloroform. The developed procedure has been applied for the determination of trace amounts of phenothiazines in bulk drugs and dosage forms.

All spectral measurements were made on Shimadzu UV-150 spectrophotometer. Pharmaceutical grade phenothiazines were obtained from various firms. Stock solutions of CPH, PH, PPM and TFH were prepared by dissolving requisite amount of the samples in distilled water and then stadardised by cerium (IV) solution. Working solutions were prepared by appropriate dilution of the stock solutions with distilled water. Chlorophenol red was prepared in distilled water (0.1% W/V).