Nigerian Journal of Paediatrics 15: 1 - 6

Accuracy of Home-Made Salt-Sugar Solution: Does Method Make a Difference?

WR BRIEGER[+] AND BU CHIRWA[*]

SUMMARY

Brieger WR and Chirwa BU. Accuracy of Home-made Salt-Sugar Solution: Does Method make a Difference? *Nigerian Journal of Paediatrics* **1989; 15: 1**

Home- made salt-sugar solution (SSS) for preventing and treating dehydration during diarrhoea is a central part of the child survival revolution. At the same time, some professionals are concerned that mothers may make a solution which is too high in sodium. This paper has identified that both the nature of the SSS formula and the method of health education used to teach that formula may affect mothers ability to make a correct solution. In particular an interactive, participatory education approach focused on the new standard of one level 3ml teaspoon of salt facilitates production of a more accurate and safe solution in the home.

Introduction

THE use of home-made salt sugar solution (SSS) for the control of diarrhoea and prevention of dehydration is a primary health care innovation that gives mothers the capability of saving their own children's lives. Yet, some fear has been expressed that mothers may do more harm than good if they do not follow the recipe precisely, especially as regards salt[1-3]. Prepackaging the ingredients does not always overcome the problem [4], and such packets are not always available when mothers need them [5 6].

Fortunately mothers can be taught to prepare an SSS mixture which compares favourably with the prepackaged variety [5 7 8].

One of the earliest SS formulae was developed in Nigeria in the 1950s [9] and was later formalized with a special plastic spoon[10]. Distribution problems and lack of standard home water measures made this global solution impracticable[11]. In the meantime other formulae were devised in other countries[12] as well as in Nigeria[13]. The difficulties encountered by mothers with measuring some of these formulae[13] led to the development of a solution that was standardized around a simple measure that could easily be found at home: one level 3ml teaspoon of salt, ten level 3 ml teaspoons of sugar and one beer bottle or two

University College Hospital, Ibadan
African Regional Health Education Centre
Department of Preventive and Social Medicine

[+] Senior Lecturer
[*] MPH (Health Education) Student

soft drink bottles of clean water (600 ml)[6].

This paper describes the experience of teaching mothers the new SSS formula at the Oral Rehydration Therapy (ORT) Unit at the Igbo-Ora Rural Health Centre in Oyo State. The purpose is to demonstrate any advantages of the new formula over the old, in terms of mothers' ability to mix accurately and also to show the influence of health education methods on facilitating acquisition of that skill.

Materials and Methods

A follow-up survey was designed to evaluate the health education component of the Igbo-Ora ORT Unit to assess gain and retention of mothers' knowledge and skill concerning the cause prevention and treatment of diarrhoea. Particular attention was focused on ability to state the SSS formula and prepare it, using the beer bottle and spoon measures. Inadvertently, it became possible to compare the accuracy of mothers' knowledge and skill on two different SSS recipes, which became the subject matter of this paper.

From 1978 until 1985 health talks for patients attending the health centre clinic in Igbo-Ora often with preparation of home- made SSS using a three-finger pinch of salt, a four-finger scoop of sugar and a cup of water (one point)[9]. Individual counselling of mothers whose children presented with diarrhoea also included this formula. Over the years many members of the community had been exposed to the SSS idea, but not in a systematic way. With the advent of the ORT Unit in September 1985, an intensive educational programme was developed. When children during registration complain of diarrhoea, they and their mothers are immediately referred to the ORT Unit. After an assessment for dehydration and the administration of solution made from UNICEF packets, a pretest of mothers' knowledge about dirrahoea and SSS is conducted by the two health aids who staff the Unit. An interactive educational discussion session follows, facilitated by the health aides. This starts with mothers' own ideas and builds up a sound understanding of the diarrhoea process by showing similarities between traditional and modern concepts. This session culminates in a participatory demonstration where mothers practise measuring the salt and sugar. After medical or nursing personnel certify that the child is fit to go home, a posttest is given to each mother.

During the first nine months of the programme, 477 Igbo-Ora mothers with their pre-school children visited the ORT Unit. These became the target group for follow-up home visits which began in August 1986. The visiting team consisted of one health aide from the ORT Unit and one of the researchers (BUC). A questionnaire, similar to the pre/posttest was administered. An observation checklist was employed to determine mothers' skills in preparing SSS.

As a result of the high mobility among Igbo-Ora women[14], a total of 124 mothers were found at home after three visit per house. These mothers were the experimental group. A control group of 110 mothers was obtained through geographical matching. Once an experimental mother was located, a control who also had a pre- school child, but had not attended the Unit was sought in the same area. The low number of control mothers also reflects the difficulty of finding mothers due to their economic and trade activities.

Analysis was done to determine the accuracy of the recipe each mother knew and could measure out with particular reference to salt. The emphasis here is on salt because even a little excess poses the danger of hypernatraemia[7-8]. In contrast, there is greater leeway in acceptable levels of sugar [5]. The experimental follow-up and control group data represent measured amounts of salt, whereas the experimental pretest data consists only of verbal responses.

The correct amount of salt for the beer bottle of water is one 3ml teaspoon of salt levelled, yielding 1.9 to 2.6 grammes[6]. The pinch and cup method is much more variable. The three-finger pinch of salt

is estimated to be between one-fourth and one-third of a leveled 3ml teaspoon. The typical cup (metal or plastic) referred to contains approximately 455ml (one pint) of water.

A typical water glass, also called a cup by some mother, holds half that amount. In fact, there is a great variety of cups in the local market, hence, one of the problems with the old formula.

For the purpose of analysis, any measure of salt more than the levelled 3ml teaspoon (including an unleveled spoon) was considered to be greater than the desired amount for a beer bottle of water. Less than the level teaspoon was lebeled as under the required amount. Proportionately, the 455ml cup could actually take up to three-fourths of a level teaspoon, but since mothers had been previously taught to use the three-finger pinch, this amount was used as standard for the cup recipe. Actual responses included two finger pinch, three-finger pinch, level spoon, full spoon and two or more spoons. Therefore, one spoon (level or other-wise) and above was considered as too much salt. The two-finger pinch was less than required.

Results

Table I compares experimental mother's knowledge about adding salt to SSS prior to education at the ORT Unit and their knowledge ability for adding salt using the bottle method on follow-up. Since all mothers could recite the bottle method correctly on the immediate posttest, there was no point using this for comparison with their pretest knowledge on the cup method.

Only 30 (39.0%) of the 77 pretest group who knew of SSS by cup could state the correct amount of salt, while 44 (5 7.1%) mentioned too high an amount. In contrast, 99 (89.2%) of 111 who remembered the bottle method at follow-up were able to measure the salt correctly, with only seven

TABLE I

Comparison of Pretest and followup knowledge and Methods of Salt-Sugar Solution Preparation Among Experimental Mothers

Salt Measure	Time/Method Pretest/Cup(%)	Followup/Bottle(%)	Total
Less then correct amount	3 (3.9)	5 (4.5)	8
Correct amount	30 (39.0)	99 (89.2)	129
More than correct amount	44 (57.1)	7 (6.3)	51
Total	77	111	188

$x^2 = 60.065$, 2df, $p < 0.0005$

*Pretest stated ingredients/amounts only; followup stated and demonstrated.

TABLE II

Comparison of Pretest and followup knowledge and Methods of Salt-Sugar Solution Preparation Between Cup and Bottle Methods

Salt Measure	Method Cup(%)	Bottle(%)	Total
Less then correct amount	2 (4.9)	5 (18.5)	7
Correct amount	22 (53.6)	15 (55.6)	37
More than correct amount	17 (41.5)	7 (25.9)	24
Total	41	27	68

$x^2 = 4.065$, 2df, $p > 0.10$

(6.3%) giving a greater amount.

Of the 13 experimental mothers who still recalled the cup method at follow-up, none prepared an under amount of salt. Similar to the pretest responses, nine (69.2%) added too much salt, while only four had the correct idea. The most common excess measure for the cup was one spoon in both pretest and follow-up.

In the control group, a similar proportion (61.8) knew of SSS compared with the experimental at pretest (62.1%). However by now, the idea of using the bottle to measure water had diffused in the community such that 27(39.7%) of 68 of controls who knew of SSS mentioned this new method. These mothers reported that they heard of the bottle method through friends and at health talks in Clinics both inside and outside Igbo-Ora.

The proportion of correct salt measure in the controls was similar for both cup (53.7%) and bottle (55.6%) subgroups as seen in Table II. The bottle group had a slightly higher tendency to underestimate salt, while the cup group tended to give too much salt. The difference within this small group of mothers was not statistically significant.

The difference in knowledge of correct salt measure for those stating cup method between experimental pretest mothers and the controls was not significant ($X^2 = 2.645$, 2 df, $p \rhd 0.2$). On the other hand, the experimental follow-up group who remembered bottle method were much more accurate in their salt measure than the controls who also used bottle ($X^2 = 17.256$, 2df, $p < 0.0005$).

Discussion

Two themes emerge from the data. One concerns the SSS recipe itself. The second involves the methods by which mothers learn about oral rehydration.

It appears that the full, but levelled 3 ml teaspoon as a measure of salt is easier for mothers to comprehend and use. In fact, plastic technology has made such spoons easily and cheaply available

throughout the country. The use of an available, acceptable and standard measure should help reduce the potential dangers of excess sodium.

The water container itself also has a role to play, and it is fortunate that one beer bottle suits itself conveniently to a level 3ml teaspoon measure of salt. These bottles are standard measures easily obtainable in or near most homes, and do not vary greatly in volume like the cups and glasses found in the market.

Those mothers learning the bottle recipe through the participatory educational process at the ORT Unit produced more accurate salt measures than either those using the cup or the controls who used bottle. Both of these latter groups learned about SSS either through general talks for large groups or by word of mouth. More active involvement in the learning process by small groups of women seems to enhance the ability to make SSS accurately.

As noted, the basic study from which this paper derived was not intended originally as a comparison between preparation of different SS formulae. Now having seen the benefits of such a comparison, the authors recommend that staff of other ORT Unit plan similar comparative studies, not only to test relative mixing efficacy among formulae, but also to learn more about the effectiveness of different health education approaches.

Acknowledgements

UNICEF Nigeria provided funds for establishing the ORT Unit at Igbo-Ora through their operational research activities. BU Chirwa was able to participate in this study as part of his overall study programme under a scholarship from WHO.

Refereпces

1. Harlend PSEG, Cox DL, Lyew H and Lindo Composition of oral solutions prepared by Jamaican mothers for treatment of diarrhoea. *Lancet* 1981; 1: 600-1

2. Levine MM, Hughes TP, Black Re, Clements ML Metheny S, Siegel A, Cleaves F, Gutierrez C, Foote PF and Smith W. Variability of sodium and sucrose level of simple sugar/salt oral rehydration solutions prepared under optimal and field conditions *J Pedtiar* 1980; 97: 324-7

3. Cutting WAM. Rehydration solutes and domestic measurements *Lacent* 1977; 2: 663-4

4. El-Mougi M, Santosham M, Hirschhorn N, El-Hadi M, El-Akkad N, Abdel Khalek H and Hosni O. Accuracy of mixing oral rehydration solution at home by Egyptian mothers *J Diar Dis Res* 1984; 2: 159-61.

5. Clement ML, Levine MM, Cleaves FT, Hughes TP, Cacerse M Aleman E, Black RE and Rust J. Comparison of simple sugar/salt versus glucose electrolyte oral rehydration solutions in infants diarrhoea. *J Trop Med Hyg* 1981; 84: 189-94.

6. Grange AO, Okeahialam TC, Seriki O, Muogbo DC, Opaleye O, Salawu O, Gleason G, Brody A and Magan A. Standardization of home-made salt-sugar solution for the treatment of acute diarrhoea diseases of childhood in Nigeria. *Nig J Paediatr* 1985; 12: 41-7.

7. Raghu MB, Deshpande A and Chintu C. Oral rehydration for diarrhoea diseases in children. *Trans Roy Soc Trop Med Hyg* 1981; 75: 552-5.

8. de Zoysa I, Carson D, Feacham R, Kirkwood B, Lindsay-Smith E and Loeweson R. Home-based rehydration therapy in rural Zimbabwe. *Trans Roy Soc Trop Med Hyg* 1984; 78: 102-5

9. Morley DC. Paediatric priorities in the develoing world London: Butterworths. 1973: 286-7

10. Morley DC and King M. Spoons for making glucose salt solutions *Lancet* 1978; 1: 612.

11. World Health Organization.Oral rehydration therapy for treatment of diarrhoea in the home. Geneva: WHO 1986; WHO/CDD/SER/86.9.

12. In-service Education Division, Ministry of Health and Social Welfare and the Christain Health Association. Caring for children with diarrhoea, 2nd ed. Monrovia; Liberia: Ministry of Health and social Welfare. p.3.

13. Reyes PS. Mothers management of child diarrhoea in Lagos, Nigeria. Thesis submitted to the School of Hygiene and Public Health, The Johns Hopkins University. Baltimore 1981: 230.

14. Brieger WR. Maternal migrations and child health. *Trop Pediatr* 1984; 30: 262-6.

15. Mahalanabis D, Merson M H and Barua D. Oral rehydration therapy - recent advances. *Wld Hlth Forum* 1981; 2: 245-9.

Accepted 24 Sept. 1987