Knowledge, attitudes and practices of mothers and health workers in relation to the use of sugar and salt solution in Masvingo Province, Zimbabwe

V NYATOTI, Z NYATI, S MTERO

SUMMARY

A study was carried out (March–April 1992) in the rural, urban and farming areas of Masvingo Province in Zimbabwe to assess the knowledge, attitudes and practices of mothers and health workers on the use of sugar-salt solution. Twenty mothers from each area were also asked to prepare sugar-salt solution and the solutions were analysed for sodium and sucrose content.

A total of 257 mothers out of 300 knew of the sugar-salt solution. Of these 58 pc from rural, 40 pc from urban and 63 pc from farming areas, said that they gave sugar-salt solution as the first line of action in managing diarrhoea.

Mothers were not exactly sure of the amounts of sugar-salt solution to give the child with diarrhoea. Responses ranged from a mere three teaspoons per day, to cupfuls and bottle capfuls although the majority (60 pc from rural areas, 72 pc from urban areas and 77 pc from farming areas) claimed that they gave the whole 750ml bottle of the solution per day. The commonest response on the frequency of administering the SSS was “after every loose stool” which was mentioned by 30 pc of the mothers in the rural areas, 35 pc in the urban areas and 54 pc in the farming areas.

Recall of the standard method of preparation of sugar-salt solution was good for the majority of mothers in all the three areas but the mean sodium concentration of the solutions prepared by mothers in the rural,
urban and farming areas were 20.56 mmol/litre, 19.76 mmol/litre and 39.62 mmol/litre respectively. This is significantly lower than the recommended Zimbabwe Ministry of Health's safe range standard sodium concentration of 50–80 mmol/litre \((p = 0.05 \ n = 80)\). The mean sucrose concentration for the same solutions were 76.35 mmol/litre, 56.19 mmol/litre and 69.24 mmol/litre respectively and these are within the safe range of the Ministry's recommended standard.

General observations revealed that the majority of mothers did not appreciate the value of the 750ml bottle as a measuring utensil but rather used it for storage purposes. All the health workers from the three study areas claimed that they advised the use of sugar-salt solution at the onset of an episode of diarrhoea. The majority said that they demonstrated the preparation of sugar-salt solution to the mothers attending the clinic. However, only 25 of the 40 health workers had had some formal training on diarrhoea, its causes, consequences and prevention. The majority of the "untrained" health workers were from the rural areas.

**INTRODUCTION**

Diarrhoeal diseases in children are an important health problem in Zimbabwe. Acute attacks of diarrhoea may cause dehydration and death due to heavy water and electrolyte losses in diarrhoeal stools. Incidence rate in Zimbabwe was estimated at 4.4 episodes per year per child under five years with an associated mortality of 4.23 per 1 000 (Unicef, 1985). A number of control strategies have been identified which pertain to child care practices in the home. Early and adequate treatment of diarrhoea especially the replacement of fluid losses is essential to prevent death due to dehydration, hence the concept of oral rehydration therapy (ORT).

Under supervision the safety and efficacy of ORT with a glucose-electrolyte solution in a health care facility has been demonstrated. Rahaman et al (1979) showed that in Bangladesh a major reduction in the fatality rates was observed when packets of glucose-electrolyte salts were distributed through village based workers. However, most rural people in developing countries have limited access to health services and distribution of health supplies and personnel is uneven. For such communities, the use of simple rehydration solutions using household ingredients has been advocated (Ellerbrock, 1981).

The Ministry of Health in Zimbabwe since 1982 has introduced a nationwide drive to encourage the early treatment of dehydration using a sugar-salt solution. This sort of intervention belongs to the home environment and therefore depends on the people's perceptions of the disease, its prevention and its treatment. Studies by de Zoysa in Zimbabwe (1984) showed that a majority of the respondents claimed knowledge of the oral rehydration techniques but only a few gave the child a sugar-salt solution at home. Even though a majority of the respondents were found to be aware of SSS, in studies by Mteto et al (1988) most of them had a strong misconception that it cured diarrhoea.

To obtain the maximum rate of water and electrolyte absorption in the dehydrated child, the oral rehydration solutions should closely approximate the WHO/UNICEF recommended standards (sucrose 210 mmol/l, sodium 90 mmol/l) (WHO/UNICEF, 1986). This formula is a little more sophisticated as it also contains sodium bicarbonate and potassium chloride. The recommended method of preparation of sugar-salt solution in Zimbabwe is six level teaspoons of sugar, half level teaspoon of salt in 750ml of water. This recipe provides for 50–80 mmol/litre of sodium and approximately 80 mmol/litre of sucrose per litre which is effective in treating dehydration (Nathoo et al 1988), but is an incomplete formula lacking both potassium and bicarbonate.

Others have questioned the safety of simple sugar-salt solutions prepared and administered without the supervision of a health worker (Ransome-Kuti, 1978). Inaccurate preparations can result in hyperosmolar solutions which could induce hypernatraemic dehydration in infants. Hypernatraemia was reported in studies by Nathoo et al (1988) where one patient presented with a sodium level of 180 mmol/litre and the mother had used 2.5 teaspoonfuls of salt and six teaspoons of sugar in 750 ml of water in preparing the sugar-salt solution.

Difficulties have been reported in South Africa in implementing ORT programmes (Wagstaff and Mthasibe, 1989). Failure to give adequate quantities of the fluid was identified as a major weakness of the ORT programmes. There is universal concern that unsupervised mothers may not give their sick children enough oral rehydration fluid (Synder et al, 1982; Cutts, 1988). Planning, implementation and evaluation of health
education involves establishing what the mothers know and do when children have diarrhoea and what the health workers teach. Health workers in Zimbabwe have been shown to be advocating the use of sugar-salt solution as the first line of action in the management of diarrhoea (Miero et al, 1988).

Despite the fact that many have reported widespread awareness of sugar-salt solution, there is need to monitor the programme more closely.

The purpose of this study was, therefore, to assess the current knowledge, attitudes and practices of mothers in the use of sugar-salt solution as well as determine their accuracy in the preparation of the solutions. In addition, knowledge and attitudes of health workers on the subject were also assessed, with a view to recommending better strategies for home management of diarrhoeal disease.

MATERIALS AND METHODS

Three areas in Masvingo Province were chosen for the study and these were two adjacent rural areas (Chikarudzo and Nemawa), an urban area (Mucheke township) and a farming area (Hippo Valley Estates).

Multistage stratified sampling technique was used in the study. The initial stage was selection of areas in Masvingo Province belonging to three strata; rural, urban and farming areas. This was followed by random selection of villages in rural areas, streets in the urban area and compound sections in the farming area. A total of two villages, five streets and five compound sections were selected. The final stage in sampling involved the random selection of 300 households, 100 from each study area.

Information was sought on the use of sugar-salt solution by mothers. Of the 300 respondents visited, 253 had under their care a child under the age of five and 255 respondents reported an episode of diarrhoea to have occurred four weeks prior to the study. The study relied on household based interviews using a questionnaire. Indicators used to measure the impact of ORT programmes in this study were the use or practices indicators, knowledge or skills indicators and the sodium and sucrose content of the solutions prepared by the mothers.

Information sought on the action taken by mothers on an episode of diarrhoea, included the amount of sugar-salt solution given per interval and frequencies with which to give the sugar-salt solution. Health centres serving the selected study areas were visited and information on health workers' knowledge about sugar-salt solution, attitudes towards sugar-salt solution, what they taught mothers and how they taught mothers was sought using an interview schedule. A total of 40 health workers were interviewed. These included State Registered Nurses, State Certified Nurses and nurse aides.

Collection of sugar-salt solution samples: Every fifth mother from each area (rural, urban and farming areas) was asked to prepare the solution under supervision. A total of 60 sugar-salt solution samples were collected in sterile 100 ml bottles and these were kept frozen until the chemical analysis was performed in Harare. The sodium concentration was determined by photometry and the sucrose concentration by polarimetry. Both analyses were performed at the Government Analyst Laboratory.

RESULTS

A. Knowledge and use of sugar-salt solution.

As shown in Table I, the majority of mothers claimed to have heard of SSS (257 out of 300) although quite a large proportion of mothers (43 out of 300) said they had not heard of SSS. A positive correlation was observed between mothers who had knowledge of sugar-salt solution and those who had used it. It is important to note that of the 12 mothers who had heard of sugar-salt solution but had not used it, eight had no child who had suffered from diarrhoea before and the remaining four said that they did not appreciate the use of sugar-salt solution.

Table I: Use and knowledge of sugar-salt solution.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Have used SSS</th>
<th>Have not used SSS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have heard about SSS</td>
<td>245 (95 pc)</td>
<td>12 (5 pc)</td>
<td>257 (100 pc)</td>
</tr>
<tr>
<td>Have not heard about SSS</td>
<td>0 (0 pc)</td>
<td>43 (100 pc)</td>
<td>43 (100 pc)</td>
</tr>
<tr>
<td>Total</td>
<td>245</td>
<td>55</td>
<td>300</td>
</tr>
</tbody>
</table>

Each respondent who knew of the SSS was then asked to describe the recipe in detail. The standard formula of sugar-salt solution which is six level teaspoons of sugar and half a level teaspoon of salt in 750 ml of the cleanest water available, was well recited by 85 pc of the mothers from the rural areas, 82 pc from the

97
urban areas and 89 pc from the farming areas.

However, when a sample of mothers were asked to prepare the solutions, the results were quite different. The number of teaspoons of sugar added varied from two to eight teaspoons, both levelled and heaped. Amounts of salt added varied from half a teaspoon to four teaspoons. It was noted that in some cases the 750ml bottle was not used to measure the required volume of water, rather it was used for storing the solution. Jugs and cups were common devices used to measure the water and in the end either too much or too little water was added.

Electrolyte and sucrose content of the sugar-salt solutions prepared by mothers.

Electrolyte content: The mean sodium concentration of the solutions prepared by mothers in the rural, urban and farming areas was 20.56 mmol/litre, 19.56 mmol/litre and 39.62 mmol/litre respectively. These means are all significantly lower than the recommended Ministry of Health, Zimbabwe, standard of 80 mmol/litre (p = 0.05 n = 80) which renders the solutions ineffective. Furthermore, comparing the three study areas, the mean sodium concentrations of the solutions prepared by the mothers from the rural and urban areas were significantly lower than that of the solutions from the farming areas (p = 0.05 n = 60). In fact the farming mothers were much better off, with as many as 10 solutions (50 pc) falling within the “safe and effective” range, i.e. 30–80 mmol/litre of sodium compared to only two in the urban area and none in the rural area (see Table II). However, one solution prepared by a mother from the farming areas had a sodium concentration as high as 178.30 mmol/litre. This is considered hypertonic and could induce hypervolaemic dehydration if given to a child.

Sucrose content: The mean concentration of sucrose for the solutions from the rural, urban and farming areas was 76.35 mmol/litre, 56.19 mmol/litre and 69.25 mmol/litre respectively. There was not significant difference amongst the means. Moreover, the three means did not differ significantly from the standard of 80 mmol/litre (p > 0.05 n = 80).

Again, it was mothers from the farming areas who had the larger proportion of solutions (nine out of 20) falling within the ‘safe and effective’ range, i.e. 50–90 mmol/litre of sucrose compared to the urban or rural areas (see Table III)

### Table II: Sodium concentrations of sugar-salt solutions prepared by mothers.

<table>
<thead>
<tr>
<th>Sodium concentration (mmol/litre)</th>
<th>Rural area</th>
<th>Urban area</th>
<th>Farming area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–29 (100 pc)</td>
<td>20</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>30–80 (50 pc)</td>
<td>0</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>&gt;80 (5 pc)</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total samples</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

### Table III: Sucrose concentrations of sugar-salt solutions prepared by mothers.

<table>
<thead>
<tr>
<th>Sucrose concentration (mmol/litre)</th>
<th>Rural area</th>
<th>Urban area</th>
<th>Farming area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–49 (45 pc)</td>
<td>9</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>50–90 (25 pc)</td>
<td>6 (30 pc)</td>
<td>5 (25 pc)</td>
<td>9 (45 pc)</td>
</tr>
<tr>
<td>&gt;90 (25 pc)</td>
<td>5</td>
<td>3 (15 pc)</td>
<td>5 (25 pc)</td>
</tr>
<tr>
<td>Total samples</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

B. Attitudes of mothers.

**Perceived effects of sugar-salt solution:** The attitudes of mothers towards sugar-salt solution were determined by establishing what they perceived as the effects of the sugar-salt solution. A large proportion of mothers (43 pc from rural areas, 44 pc from urban and 54 pc from farming areas) still thought that sugar-salt solution cured diarrhoea or was like some form of medicine. Most mothers also pointed out that if the diarrhoea did not stop after giving sugar-salt solution they would take the child to the health centre, 87 pc, 84 pc and 94 pc from urban, rural and the farming areas respectively. Four mothers said they would resort to anti-diarrhoeal mixtures.
C. Practices of mothers.

First line of action: At the onset of an episode of diarrhoea in an under-five year old, giving sugar-salt solution was the commonest first line of action taken by mothers in the rural (81 pc), urban (63 pc) and farming (71 pc) areas as shown in Table IV below. Of interest was the fact that some mothers said that they would change the feeding patterns (14 out of 225). Of these one mother from the rural areas said that she would stop breastfeeding her child and the rest said that they would reduce fluid intake.

Table IV: Action taken by mothers at the onset of an episode of diarrhoea.

<table>
<thead>
<tr>
<th>Action taken</th>
<th>Study area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
</tr>
<tr>
<td>Gave SSS</td>
<td>58 (81 pc)</td>
</tr>
<tr>
<td>Visited clinic/hospital</td>
<td>10 (14 pc)</td>
</tr>
<tr>
<td>Changed feeding patterns/other</td>
<td>1 (1 pc)</td>
</tr>
<tr>
<td>Did nothing</td>
<td>3 (4 pc)</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
</tr>
</tbody>
</table>

N.B. Totals do not add up to 100 for each study area since the rest were mothers with children who had not had an episode of diarrhoea 16 weeks prior to the study.

Amount of sugar-salt solution given: The question on the amount of sugar-salt solution given to a child with diarrhoea was asked in order to establish whether the mothers had any ideas about the amounts needed to replace lost fluids in the body. Of the mothers who claimed that they gave the whole 750 ml of the solution per day, 60 pc were from the rural area, 72 pc from the urban area and 77 pc from the farming area. Utensils such as cups, teaspoons, tablespoons and bottle caps were mentioned by some mothers as devices for administering the solution. From informal discussions with the mothers, great concern was expressed over the amounts of sugar-salt solution which should be given to the child with diarrhoea. Some said that large amounts of sugar-salt solution were difficult to administer because most children did not like the taste. Also the cup per loose stool instruction was not appreciated by mothers, because of unobserved stools, as they were not constantly around the child.

Frequencies with which sugar-salt solution is administered: The frequencies with which sugar-salt solution is administered by mothers at the onset of diarrhoea were different among the rural, urban and farming areas (Table V). The commonest response in the farming areas was "after every loose stool" whilst in the rural and urban areas this response was equally common with "whenever the child is thirsty".

Table V: Frequencies with which sugar-salt solution is administered at the outset of diarrhoea.

<table>
<thead>
<tr>
<th>Frequency of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Urban</td>
</tr>
<tr>
<td>Farms</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

D. Health worker survey.

(1) Knowledge: Health workers normally receive training on the control aspects of diarrhoeal diseases. Out of the 40 health workers interviewed 25 had received this training. Of the 15 who had not received the training, 13 were nurse aides, one a state certified nurse and one a state registered nurse.

All the health workers from the study areas knew that diarrhoea was a serious disease, in that it caused dehydration and could result in death. Out of the eight health workers at the urban clinic five said that they would treat dehydration by giving the child sugar-salt solution. The remaining three did not know what to do.

Similarly, all the health workers interviewed at the rural health centres and in the farming areas claimed that they would give sugar-salt solution in order to replace the lost fluids. The action of sugar-salt solution was known by all the health workers except one from the farming areas who thought that sugar-salt solution was used because of the inexpensive ingredients.

The general response on when mothers should give sugar-salt solution was after every loose stool except for three health workers from the urban area and four
from the farming areas who felt that sugar-salt solution should be given every few minutes.

(2) Attitude: A positive attitude towards the use of sugar-salt solution was shown by the fact that in the three study areas, all the health workers claimed that they advised mothers to use sugar-salt solution at the onset of diarrhoea.

The general methods of teaching mothers the management of diarrhoea and the use of sugar-salt solution included lecturing and demonstrating on the preparation of sugar-salt solution. Generally, mothers are also advised to continue breastfeeding the child with diarrhoea, according to the health workers.

DISCUSSION

It is well recognised that the ultimate control of diarrhoeal diseases requires an understanding of the causes and the consequences of diarrhoea. The stools of the child with diarrhoea contain large amounts of water and salts and these should be replaced by the use of sugar-salt solution and fluids.

In this study carried out in selected rural, urban and farming areas of Masvingo Province it was found that the respondents were aware of the consequences of the disease. Of the mothers recalling an episode of diarrhoea occurring 16 weeks prior to the study, 58 pc in the rural areas, 40 pc in the urban area and 63 pc in the farming areas claimed that they gave sugar-salt solution (SSS) as the first line of action. However, withholding breastfeeding or reducing the intake of fluids for the child with diarrhoea (changing the feeding patterns), as what 14 mothers out of the 300 said, would not help in reducing the dehydration.

Inspite of the fact that the majority of mothers in all areas of Masvingo had heard of the SSS at some stage, only about half of these knew that the solution helped by restoring the lost body fluids. Some were under the misconception that it cured diarrhoea. It is felt that unless the communities fully understand the basics of oral rehydration therapy then the programme will not be successful and will not be fully implemented, as previously found in the study by Miero et al (1988). Again, changing feeding patterns, reducing the intake of fluid and ceasing breastfeeding is a consequence of lack of knowledge on the effect of ‘ORT’.

Also observed in the study was that in all the three strata, mothers with a child who had never had diarrhoea did not know about sugar-salt solution and its preparation. These mothers were probably those who did not frequent the clinics and had not been exposed to these events. Studies by de Zoya et al (1984) showed that mothers and child minders in Zimbabwe were easily motivated and were able to quickly learn oral rehydration techniques.

Even though the theoretical knowledge of the sugar-salt solution recipe was good in the study areas, the solutions prepared by a representative sample of the mothers had varying sodium and sucrose concentrations, which were far below the standard concentrations. The results confirm what was found by Erasmus, (1981) that the composition of home-made oral rehydration solutions is often wrong. To obtain the maximum rate of water and electrolyte absorption in the dehydrated child, the oral solutions should closely approximate the WHO/UNICEF recommended standards.

The sodium concentrations of the solutions prepared by the mothers from rural and urban areas were very low and one solution prepared by a mother from the farming area had excess sodium (Table II). Solutions with very low concentrations of both sucrose and sodium are rendered ineffective and no improvement in the dehydrated child will be apparent.

At the same time solutions with excess salt and sugar can lead to a hyperosmolar solution which may worsen the diarrhoea and induce hypovolaemic dehydration.

Observations carried out by the investigators revealed that the wrong compositions of these solutions was due to lack of concentration by mothers during the process of counting and also failure to count the number of teaspoons added. Too much water was added in most of the cases because the 750ml bottle was not used as a measuring device. This could possibly be improved if clear demonstrations on the preparation of sugar-salt solution are made by health workers to the mothers. Use of the different utensils (spoons, knives and 750ml bottles) should also be explained to these mothers, so that they appreciate the importance of measuring the correct quantities.

Not all the respondents who fully aware of when to give sugar-salt solution. Some were of the impression that like most medicines, it had to be given only three times a day, that is, in the morning, afternoon and evening using a teaspoon (36 pc in the rural area, 36 pc in the urban area and 28 pc in the farming compounds).

Mothers were also concerned about the actual amounts of sugar-salt solution to give per given interval. Though this was not thoroughly investigated in the
studied, it became apparent from the questions raised by the mothers, that the amounts to give are not clearly stated to them by the health workers. Some mothers said that they would administer three teaspoons of sugar-salt solution per day and in some cases would use tablespoons or bottle caps. These data confirm the suspicion that the quantity of ORS given in home-based therapy is often far less than the recommended guidelines of 100 ml kg\(^{-1}\) body weight day\(^{-1}\), supporting findings by Touchette et al (1990). The cup per loose stool instruction obviously does not approximate found in the study. It is clear education messages on the basic concepts of diarrhoea and the sugar-salt solution. The health education message was uniform it is important for an intensive campaign to be conducted covering the aspects of causes of diarrhoea, consequences of diarrhoea, sugar-salt solution and its preparation, how it helps, amounts to be given per set interval and the frequency with which to administer sugar-salt solution. Special attention needs to be paid on setting up reasonable frequencies of administering the sugar-salt solution because failure to give adequate quantities of the fluid is a major weakness of ORT programmes. Studies by Mushtaque et al (1988) clearly showed that teaching and demonstrating the use and preparation of sugar-salt solution was very successful either in groups or to individuals.

The success of this health education on the use of sugar-salt solution can be further enhanced by asking the mothers to prepare the solution under supervision after the demonstrations given by health workers. The present study indicated that mothers did not know how sugar-salt solution helped the sick child and were uncertain about the amounts of the solution to give.

Conclusions: The investigations carried out in selected rural, urban and farming areas of Masvingo Province have shown that there is widespread general knowledge about sugar-salt solution amongst both mothers and health workers. However, the actual use of sugar-salt solution by the mothers, which was lower in the urban areas, seems to be hindered by the lack of knowledge on causes of diarrhoea, consequences of diarrhoea, effects of sugar-salt solution, amounts to give and the frequency with which it should be administered.

Health workers know about sugar-salt solution and have a positive attitude towards the use of sugar-salt solution. Advice on using sugar-salt solution is being given to the mothers. Again what seems to be lacking here is clear education messages on the basic concepts of diarrhoea and the sugar-salt solution. The health education in all the three strata probably is not being delivered in a way best understood by mothers. The electrolyte composition of the sugar-salt solution prepared by the mothers was lower than the recommended Ministry of Health standard, which further verifies the findings.

It is apparent that more research is needed to establish the real amounts of sugar-salt solution administered by mothers to children with diarrhoea and also investigate the best possible means of delivering these solutions to the children. Conducting structural or unstructural observations on the affected families would probably yield the much needed information which may not sometimes be apparent from a mere KAP study.

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REFERENCES


Haemoglobin A₂ (Hb A₂) and malaria

PO OLATUNJI*, AG FALUSI**, WA SHOKUNBI***, EM ESSIEN***

SUMMARY

The Packed Cell Volume (PCV), reticulocyte count and Hb A₂ were determined in 28 patients during the period of malaria parasitaemia and 14 days after effective treatment. The Hb A₂ was determined by cellulose acetate haemoglobin electrophoresis in alkaline medium followed by elution in water.

There was no statistically significant difference between the PCV during the period of parasitaemia and that after treatment (p > 0.05). The Hb A₂ level did not show any significant difference during and after treatment of malaria (p = 0.05). The correlation coefficient between absolute parasite count and Hb A₂ level was -0.22 (p = 0.251).

It is concluded that malaria parasitaemia does not induce a significant change in the level of Hb A₂.

INTRODUCTION

Previous workers had reported on the response of Haemoglobin A₂ (Hb A₂) to infection by the malaria parasite, Plasmodium falciparum.12,3 The findings of the first two authors showed significant increase in the level of Hb A₂ during infection12 while the third author...

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