

Evaluation of oral therapy for infant diarrhoea in an emergency room setting: the acute episode as an opportunity for instructing mothers in home treatment

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One hundred infants with 1–10% dehydration resulting from acute watery diarrhoea were treated in an emergency room setting with oral glucose–electrolytes therapy. The acute episode was utilized to instruct mothers in the technique of oral therapy for diarrhoea. After initial rehydration, when the stools had lost their totally watery character, children were discharged and the mothers were instructed to continue oral therapy as needed at home and to resume milk feedings. Ninety-two percent of the infants were successfully rehydrated during the initial visit without any intravenous fluids. Eight percent required intravenous therapy because of persistent vomiting or refusal to take the oral solution in the face of significant diarrhoea. Thirteen percent of the infants were brought back to the emergency room by their mothers on account of continued diarrhoea and recurrent dehydration. Of these, 8 were rehydrated again with oral therapy and 7 were given intravenous fluids.

Oral therapy alone was successful in 85% of cases. The mean duration of stay in hospital was reduced, and 74% of the infants stayed less than 24 h, compared with 36% in previous studies at this hospital.

A study of infants hospitalized for dehydration due to acute watery diarrhoea demonstrated that 94%, including rotavirus patients, could be successfully rehydrated with an oral glucose–electrolytes solution alone, without any intravenous fluids (1, 2). The saving in intravenous fluids was substantial, since such infants, with 5–10% dehydration, had previously been treated with intravenous fluids alone; however, it was clear that an even greater reduction in costs and staff time could be achieved if admission to hospital could be avoided and the initial, emergency treatment continued in the home. In the belief that during the acute diarrhoeal episode mothers would be highly motivated to learn the

method and to cooperate, a study was undertaken to evaluate the use of oral therapy in an emergency room setting. The goal was to minimize the need for stays in hospital and to evaluate the safety and efficacy of continuing oral therapy at home after training mothers during the initial oral rehydration phase.

PATIENTS AND METHODS

Oral rehydration was administered to 100 infants with dehydration due to acute watery diarrhoea (56 males and 44 females, mean age 7.0 ± 0.5 months, range 18 days–20 months; figures in text given as $\bar{x} \pm SE$). The oral therapy formula used was similar to that proposed by WHO (3), but, since previous balance studies had revealed a mean stool potassium concentration of 37 mmol/litre (2); the potassium content was increased from 20 to 27 mmol/litre. Thus, the oral therapy formula used contained: glucose, 20 g/litre; NaCl, 3.5 g/litre; NaHCO₃, 2.5 g/litre; KCl 2.0 g/litre. The composition was confirmed by chemical analysis.

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During the study period, newly arrived infants were treated initially in a small annex to the emergency room. The annex contained 5 cribs and was supervised by one nurse-auxiliary. An intern examined new admissions, and a supervisory resident and a paediatrician were available on call when needed. Most of the infants were sent home as soon as signs of dehydration had disappeared and stools had lost their totally watery character and had become curdy or pasty. Maintenance oral therapy and/or milk was then continued at home.

Method of estimating fluid deficits on admission

Immediately after admission a brief history and physical examination (including weight) provided the basis for clinical estimation of the percentage dehydration. Infants with no detectable signs of dehydration were excluded from the study. Infants with watery stools, dry mouth, weakness, subnormal activity, and rapid but firm pulse were judged to have 1–4% dehydration. Those with (in addition) slightly sunken eyes and minimally decreased skin elasticity and turgor were clinically classed as 5% dehydrated, and those with more marked decrease in skin turgor and elasticity and pronounced sunkenness of the eyes and anterior fontanelle were classed as 6–8% dehydrated. Patients with, in addition, weak or thready pulse, were classed as 9–10% dehydrated.

Rehydration

The total amount (ml) of fluids to be given during the critical first 6 hours of rehydration was calculated as twice the product of admission body weight (kg) and the clinically estimated fluid deficit (ml/kg). For example, an infant weighing 6 kg with an estimated 5% fluid deficit (50 ml/kg) received 600 ml of total fluids during this period. This quantity ensured replacement of both preadmission deficits and ongoing losses incurred during the rehydration period. The fluids were administered from two baby feeding bottles containing oral solution (200 ml each), followed by one bottle of water (200 ml), all at 37°C. This regimen was repeated after the first 6 hours, if necessary, until hydration was clinically normal.

Rehydration was considered complete when the clinical signs of dehydration returned to normal. Comparison with estimates of dehydration based on haematocrit levels, plasma proteins, and weight gain before and after rehydration confirmed the clinical adequacy of these criteria. Skin turgor was used as a bedside guide to hydration. When hydration was

normal, infants were given milk formula (1.6 J/ml) and those over 6 months old were given purées.

The examination of sunken eyes and reduced skin elasticity, and the mode of administering the oral solution, were explained to the mothers by the intern and the auxiliary. Mothers took an active part in administering the oral solution to their children.

After the first 6 hours, normally hydrated infants whose stools were not very voluminous or totally watery were sent home. On the basis of a previous study (2), which indicated that only 23% of such infants required more than 24 h of oral therapy (mean requirement: 700 ml of oral solution in 24 h), each mother received a 250-ml plastic bag containing 100 ml of 10× concentrated oral solution and an instruction sheet on oral therapy (see Annex). Mothers were told to continue the oral therapy at home if faeces appeared watery, or to use milk or milk formula diluted 1:1 with boiled water, 240 ml every 4–6 h, and to resume normal feedings when faeces appeared pasty or semiformal. Mothers were instructed to return in case of any recrudescence of diarrhoea or aggravation of the infant's condition.

Antibiotics were given only for specific indications, such as concomitant otitis media, pneumonia, or clinical evidence suggesting shigellosis. As we wished to use only those methods that were available at rural health posts, and as previous studies of electrolyte balance had confirmed the safety and efficacy of oral therapy in this population (1, 2), all laboratory examinations were omitted, but infants were weighed every 6 hours during their stay in hospital.

RESULTS

Efficacy of oral therapy in the emergency room setting

Ninety-two percent of newly admitted patients were successfully rehydrated with oral therapy alone, and there were no deaths. Rapid weight gain (0.32 ± 0.002 kg by 6 hours, $n=84$, $P=0.001$; 0.39 ± 0.002 kg by discharge, $n=87$, $P=0.001$) and disappearance of clinical signs of dehydration, such as reduced skin turgor, sunken eyes, and sunken fontanelle, indicated absorption of the oral solution. There were no complications except mild transient palpebral oedema in 11 patients. Body weight of these 11 infants rose from 5.4 ± 0.1 kg to 5.9 ± 0.1 kg by 6 hours; discharge weight fell to 5.8 ± 0.1 kg, indicating a mean overhydration of 2% in these 11 cases. Oedema disappeared within a few hours of reducing the rate of oral therapy.

Sixty percent of infants entered with dehydration of 5% or more, including 10 with dehydration over 10% and 1 with 14% dehydration. Eighty-nine percent had vomited before arrival. The duration of diarrhoea before admission averaged 4.4 ± 0.5 days (range 1–30 days). Fifty-three percent of the patients had been ill for 3 or more days, and 23% for 7 or more days. Eighty-one percent were febrile on arrival ($38.8 \pm 0.8^\circ\text{C}$) and 15 cases had concomitant otitis media (14 bilateral), 3 cases had pharyngitis, 3 bronchitis, 1 tonsillitis, 1 pneumonia, 3 conjunctivitis, and 1 impetigo. Eighteen percent had first degree malnutrition and the same percentage had second degree malnutrition (Gomez classification (5)). These complications did not interfere with the successful outcome of oral therapy.

Acceptability of oral therapy

Most infants drank the solution avidly, although no flavouring agent was added. Some infants accepted the solution only from their mothers; others took it only when it was offered in the baby bottle they used at home. Some infants with minimal dehydration were apparently not thirsty and refused the oral solution but accepted half-strength milk formula. The total intake of oral solution plus milk formula in the emergency room averaged 1.3 ± 0.7 litres. Forty-one percent of infants vomited during therapy (21 once, 10 twice), a mean of 1.9 ± 0.2 episodes per infant. Only 3 vomited more than 3 times. Two of these and 6 others who refused to drink enough oral fluid were given intravenous fluids. In most cases vomiting was not a significant impediment to continuing oral therapy.

Rehydration interval and duration of stay

The mean time for disappearance of clinical signs of dehydration was 6.4 ± 0.2 h (range 1–18 h). Three infants, including one who entered with 10% dehydration, were rehydrated within 1 hour. The mean emergency room stay was 15.6 ± 8.1 h. Seventy-four percent stayed less than 24 h. Stools changed from watery to curdy in a mean of 6.2 h (range 0.5–24 h) in 70% of patients but remained watery for over 24 h in the remainder.

Readmissions

Thirteen infants were brought back by their mothers with recurrent dehydration; 6 of them were again orally rehydrated and 7 received intravenous fluids without recourse to oral therapy, for reasons of staff preference.

Cooperation of mothers

While preliminary questions during history-taking revealed that mothers did not know the signs of dehydration, they readily learned them and mastered the instructions as regards treatment in most cases. The majority stayed at the bedside by day while the child remained in the emergency room, and helped to give the solution and to change diapers. When visits extended into the night, most mothers had to return home and could not assist.

The mothers of the 13 readmitted infants stated that they had not received the full instructions detailed in the protocol. A few of them had become concerned by the reappearance of emesis or increased diarrhoea.

DISCUSSION

The results indicate that, after a brief emergency room visit for initial oral rehydration, during which mothers are instructed in oral therapy, most infants with dehydration due to acute watery diarrhoea can be safely sent home to receive additional therapy and milk from their mothers. Prior to initiation of the studies, 90% of infants with dehydration due to diarrhoea were treated in the emergency room with intravenous fluids alone, and the duration of therapy was under 1 day in only 36%. Using the methods described it was possible to decrease the mean duration of hospital stay to under 1 day in 74% of cases, indicating a highly significant reduction in man-hours of staff time required per case, and an attendant reduction in hospital costs per case.

During the initial visit, 8% of infants required intravenous fluids on account of persistent vomiting or poor intake during initial rehydration. Another 13% returned once, of whom only 7 received optional intravenous therapy without trying oral rehydration, and the remainder were successfully rehydrated a second time with oral therapy alone. These cases indicate the need to ascertain that every mother receives proper instructions and that staff are aware of the efficacy of oral rehydration in cases of recurrence and are motivated to use oral therapy in such cases.

The high success rate is an indication of the advantage of using an actual diarrhoeal episode as an opportunity for instructing mothers. Studies are in progress to examine the impact of the instruction on maternal behaviour in subsequent diarrhoeal episodes.

RÉSUMÉ

ÉVALUATION DE LA THÉRAPIE ORALE PRATIQUÉE EN SALLE D'URGENCE POUR TRAITER LA DIARRHÉE INFANTILE: MISE À PROFIT DE L'ÉPISODE AIGU POUR INITIER LES MÈRES À L'ADMINISTRATION DU TRAITEMENT À DOMICILE

La thérapie par voie orale pour combattre la déshydratation due à la diarrhée liquide aiguë a été évaluée à la faveur d'une expérience réalisée en salle d'urgence à l'hôpital, au cours de laquelle 100 nourrissons présentant une déshydratation de 1 à 10% ont été traités par la méthode de réhydratation orale. Pendant cet épisode aigu, les mères ont été initiées à la manière d'administrer ce traitement, et les solutions orales ainsi que les instructions nécessaires leur ont été remises pour qu'elles puissent l'appliquer chez elles à leur retour, les selles ayant alors perdu leur caractère totalement liquide à la suite de la réhydratation initiale. La solution orale employée avait la composition suivante (g/l): glucose, 20; NaCl, 3,5; NaHCO₃, 2,5; KCl, 2,0.

Dans 92% des cas, la réhydratation orale a été efficace sans qu'il soit besoin de recourir à des liquides injectés par voie intraveineuse. Dans le groupe de 13% qui a dû revenir à la suite d'une nouvelle déshydratation, 7 ont reçu des

liquides par cette voie et 8 ont de nouveau été réhydratés au moyen de la thérapie orale. Il est apparu que les mères des nourrissons de ce groupe n'avaient pas reçu des instructions suffisantes pour administrer elles-mêmes le traitement.

Dans la plupart des cas, la thérapie orale a donné des résultats satisfaisants, et on n'a pas enregistré d'accident pouvant être attribué à un renvoi précoce à la maison. Les mères se sont généralement familiarisées sans difficulté avec la pratique du traitement oral. Les séjours de plus d'une journée à l'hôpital sont ainsi évités et la durée des soins en salle d'urgence est beaucoup plus brève qu'auparavant. Alors que 90% des nourrissons reçus pour la même cause étaient, avant la période de l'étude et selon les registres de la salle d'urgence, soumis à la réhydratation par injections intraveineuses, cette thérapie n'a été appliquée qu'à 15% d'entre eux pendant ladite période.

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Annex

ABBREVIATED INSTRUCTION FORM FOR MOTHERS

1. Oral therapy corrects the loss of body fluids in diarrhoea and vomiting, usually without antibiotics.
2. The oral solution contains glucose, salt, baking soda, and potassium chloride. To make the solution, add the contents of the bag plus 4 more bagfuls of drinking water to a container and mix well.
3. Fill the baby bottle with 200 ml (8 oz) of solution and warm as you would milk; offer the solution to your child as often as he/she desires. The solution can also be given by spoon-feeding.
4. If vomiting occurs, or if the stomach appears distended, wait 10-15 minutes and then continue giving the solution.
5. If fever occurs, see that the infant is not too warmly dressed and apply cloths soaked in cool water to the forehead and skin.
6. Begin feedings 6 hours after starting oral therapy, using milk or milk formula diluted 1:1 with boiled (and then cooled) water. Continue diluted milk for 1-2 days, adding purées and boiled egg as tolerated, according to your child's usual diet.
7. From time to time check the skin elasticity as instructed. If it decreases, offer more oral therapy. If there is no improvement over several hours, return to the emergency room with your child.
8. DO NOT GIVE laxatives, antibiotics, or other remedies. RETURN without undue delay if there is difficulty. RETURN if diarrhoea persists more than 1 week.