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Management of Malnourished Children with Acute Diarrhoea and Sugar Intolerance

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Summary

A protocol of nutritional rehabilitation using fermented milk, vegetable oil, and castor sugar has been tested on 54 Senegalese children age 6–36 months admitted with acute diarrhoea and malnutrition. At time of admission, 39 per cent of children were dehydrated and 26 per cent had sugar intolerance. In the course of treatment three absconded and one died from acute pneumonia with respiratory and heart failure. Among those with marasmus there were no differences in mean weight gains between children with sugar intolerance and others, despite a longer duration of diarrhoea in the first group. Furthermore, the treatment protocol has never been compromised because of worsening diarrhoea or weight loss.

These results indicate that a formula based on fermented milk together with oral rehydration can be used to treat malnourished children with acute diarrhoea and sugar intolerance.

Introduction

Acute diarrhoea and malnutrition are often associated. It is commonly recognized that early nutritional rehabilitation is necessary in cases of acute diarrhoea.[1] However, using whole milk is still a matter of debate because of frequent occurrence of sugar intolerance.[2,3] Recent studies suggest that using fermented milk could be an important alternative for nutritional rehabilitation of malnourished children with acute diarrhoea who also have sugar intolerance.[4,5]

The aim of this study was to evaluate the efficacy of a protocol using oral rehydration, together with a highly nutritive mixture of fermented milk, oil, and sugar. This survey has been conducted among preschool children admitted with acute diarrhoea and malnutrition, some of them with sugar intolerance others with no evidence of sugar intolerance.

Survey Methods

The survey was conducted in a centre for nutritional rehabilitation of the hôpital du Roi Baudouin, Pikine-Guedjawaye, a suburban area of about 600 000 people near Dakar the capital city of Senegal. The centre was set up in 1984 and works as a day-hospital. Children attend the day care with their mother from 8 a.m. to 6 p.m., and return every day until recovery.[6]

Correction and prevention of dehydration is done by using oral rehydration with the WHO/UNICEF formula and according to WHO guidelines.[1]

Nutritional rehabilitation starts from the first day and is based on a mixture of fermented milk, vegetable oil, and castor sugar that provides about 100 calories per 100 ml.[7] The mixture is prepared by the following procedure: 3 volumes of dried skimmed milk are mixed with 1 volume of castor sugar and 1 volume of vegetable oil. This makes a paste that can be kept up to 15 days in a cool dry place. Every night the nurse mixes 1 volume of the paste with 4 volumes of water and one glass of fermented milk. The following morning the mixture is ready for use for nutritional rehabilitation of malnourished children.

Children receive on the average 100 ml/kg per day when starting the treatment, in six to eight small meals. When appetite returns quantities of the mixture are increased according to the child's appetite. The regimen is then completed with enriched porridge. When children are not yet weaned, breast feeding is encouraged, never interrupted, and the mixture is given in addition.

For this survey, the protocol of rehabilitation has been the same for marasmus (weight for height below 80 per cent of NCHS standard) and for kwashiorkor (presence of oedema). The fermented milk–oil–sugar mixture has been given the same way even when a child had clinical sugar intolerance at beginning of treatment, as defined by watery stools with acid pH (<5.5) and presence of reducing sugars.[8] Screening of sugar in stools has been done by means of the clinitest.[9]

Data have been analysed on microcomputers using standard statistical software.

Results

The survey lasted 9 months, from November 1985 to July 1986. During the survey period 54 children with

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TABLE I
Characteristics of the 54 children admitted in the survey

Variables		All		Sugar+		Sugar−		
		%	(N)	%	(N)	%	(N)	*P*
Sex	Male	42.6	(23)	17.4	(4)	82.6	(19)	
	Female	57.4	(31)	32.3	(10)	67.7	(21)	NS
Age	6–12 months	35.2	(19)	47.4	(9)	52.6	(10)	
	13–24 months	55.6	(30)	16.7	(5)	83.3	(25)	$P<0.05$
	25–36 months	9.3	(5)	0.0	(0)	100.0	(5)	
Weaning	Breast-fed	44.4	(24)	41.7	(10)	58.3	(14)	
	Weaned	55.6	(30)	13.3	(4)	86.7	(26)	$P<0.02$
Type	Marasmus	88.9	(48)	25.0	(12)	75.0	(36)	
	Kwashiorkor	11.1	(6)	33.3	(2)	66.7	(4)	NS
Dehydration	Yes	38.9	(21)	38.1	(8)	61.9	(13)	
	No	61.1	(33)	18.2	(6)	81.8	(27)	NS
Vomiting	Yes	42.6	(23)	47.8	(11)	52.2	(12)	
	No	57.4	(31)	9.7	(3)	90.3	(28)	$P<0.01$

NS: not significant.

acute diarrhoea and malnutrition have been admitted at the Pikine-Guedjawaye centre. Among them, 50 children (93 per cent) have been followed-up until recovery, three (6 per cent) have abandoned during treatment and one child died (2 per cent) at day 5 from acute pneumonia with respiratory and heart failure. Three children were taken against medical advice on days 4, 6, and 11. For all the growth curve was beginning to show improvement.

At admission 14 children (26 per cent) had clinical sugar intolerance. Of these 11 had marasmus, two had kwashiorkor, and one absconded. For this last case diarrhoea had stopped when he left on day 4.

Table I shows the characteristics of the 54 children admitted.

There is a larger number of female children; among girls, there are more cases of sugar intolerance than among boys, but the difference is not significant.

With regard to age, all children with sugar intolerance are in the 6–24 months age group. They are even more frequent in the 6–12-month age group (47 per cent) than in the 13–24-month age group.

Distribution is equal with regard to weaning, but the percentage of sugar intolerance was higher in the breast-fed group ($P<0.02$).

The main clinical form of malnutrition was marasmus and the percentage of sugar intolerance was higher among the kwashiorkor cases (the difference was not significant).

Thirty-nine per cent of children had signs of dehydration at the time of admission. Among dehydrated children the percentage of sugar intolerance was higher, but not significant.

Forty-three per cent of children were vomiting at the time of admission. The percentage of sugar intolerance was higher in this group than in those not vomiting ($P<0.01$).

Table 2 shows the progress of 44 children admitted with marasmus. Children with marasmus and sugar intolerance were on the average younger than those who did not show any sugar in stools at admission (12.6 against 18.3 months).

Sugar intolerance is associated with better nutritional status since for the same mean weight at admission, the mean age of intolerant children is lower.

The weight gain during treatment with the milk–oil–sugar mixture had been the same in the two groups as assessed within 24 hours, within 1 week and at the time of discharge. The duration of treatment was the same in the two groups and the weight gains at the time of discharge expressed in g/kg of weight/day were equivalent (15.1 and 13.7 for the intolerants).

Correcting dehydration with WHO solution took somewhat longer in cases of sugar intolerance; however, the difference is not significant. Furthermore, despite the same duration of diarrhoea prior to admission (5.6 and 6.0 days for the intolerants) the duration of diarrhoea during the treatment was longer among the intolerants (4.6 days), than for the others (2.3 days).

In the kwashiorkor group, no comparative study could be done since the group is too small. For these six children, the progress was favourable and the weight gain at time of discharge was 8.5 g/kg/day. Weight increase was smaller than in the case of marasmus, in part due to loss of oedema fluid.

Discussion

Lactose intolerance in case of acute diarrhoea asso-

TABLE 2
Evolution of 44 marasmus cases until recovery

Variables	Marasmus sugar+ (N=11)	Marasmus sugar− (N=33)	*P*
Age (months)	12.63±4.43	18.30±6.96	$P<0.01$
Weight at admission (kg)	6.759±0.788	6.748±1.051	NS
Weight at 24 hours	6.898±0.753	6.903±1.046	NS
Weight at 1 week	7.309±0.695	7.321±1.125	NS
Weight at discharge	7.904±1.034	8.015±1.002	NS
Duration of treatment (days)	14.45±8.07	13.72±6.52	NS
Weight gain (g/kg/d)	13.78±6.03	15.13±4.38	NS
Duration of dehydration (days)	2.0±1.22	1.2±0.42	NS
Duration of diarrhoea (days)	4.63±2.73	2.39±1.22	$P<0.01$

NS: not significant.

ciated with malnutrition has already been documented.[10] Taking our sample into consideration, it is highly likely that lactose is the most likely sugar found in stools. In another study conducted in Senegal among malnourished children age 8–36 months, lactose malabsorbtion defined by measure of glycemia was found to be as high as 60 per cent at age 1 year and milk was badly tolerated among 20 per cent of children.[11] Our results are close to this last number since one out of four children had sugar intolerance on admission.

Rotavirus diarrhoea which frequently occurs among infants often causes lactose malabsorption.[2,12] In this case, vomiting as well as dehydration occur together.[13] In Senegal, rotavirus appears as the leading aetiological agent of diarrhoea among young children, in particular among girls; its prevalence ranges from 10 to 25 per cent depending on study areas.[14] In our survey the hypothesis of a viral infection among children who were found to be sugar intolerant could explain differences in age, sex, and the difference in clinical presentation since lactase deficiency associated with malnutrition plays a role in rotavirus pathogenicity.[15]

The difference in weaning status is probably an age effect. In Senegal weaning occurs on the average between age 1 and 2 years.

With regard to the type of malnutrition, our results are consistent with other data: disaccharide deficiency is most frequent in cases of protein malnutrition.[3]

Our protocol of treatment was effective for the two groups of children. In the case of acute diarrhoea associated with malnutrition, the WHO formula was found to be efficient despite the long time required to treat individual dehydration (24–48 hours in our study). There is a danger of retention of water and salt in this case and rehydration has to be conducted slowly and to be primarily based upon child's thirst.[16]

A formula based on milk, casein, oil and sugar has already been used with success for nutritional rehabilitation of children severely malnourished with acute diarrhoea.[17] The nourishing mixture used in this survey is simpler to prepare and has been well tolerated by children with sugar intolerance. In this group, the protocol has never been stopped because of weight loss or because of worsening diarrhoea. Furthermore, despite a longer duration of diarrhoea, weight gains have been comparable with that of children without sugar intolerance. These results can be compared with those of various authors indicating that the use of fermented milk is facilitating lactose absorption among adults as well as children with lactase deficiency.[18]

In conclusion, very simple techniques allow one to efficiently treat children with acute diarrhoea and malnutrition, and the use of fermented milk seems to be a good alternative to treat children with sugar intolerance.

Simplicity of infrastructure (a room, a scale, a full time nurse) as well as the very low cost (about 0.5 ECU per day and per child) could permit the widespread use of this technique in the most remote and poorest places, where prevalence of acute diarrhoea and malnutrition are highest.

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