Evaluation of Dowdo (Wheat-Milk Gruel) in Children with Acute Diarrhoea

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Abstract

Appropriate feeding practices have an important impact on diarrhoea! disease management in developing countries. We evaluated the efficacy of feeding d owd o, a wheat-milk gruel, traditionally used as a weaning food in the Northern Areas of Pakistan. Dowdo was compared with khitch ri, a rice-lentil mixture, in acute diarrhoea through a randomized trial. Seventy- six children between 6 and 36 months of age, with acute watery diarrhoea of less than seven days were recruited. After rehydration with standard World Health Organization (WHO) glucose-based oral rehydration solution or intravenous Ringers lactate, patients were randomly assigned to either diet group. Dowdo and Khitchri were found to be equally effective in terms of stool frequency and output, duration of diarrhoea, weight gain and duration of hospitalization. The results indicate that feeding dowdo was as effective as khitchri in children with acutediarrhoea. Additionally, acceptability of dowdo was better than Khitchri. It is recommended that dowdo be used for nutritional management of diarrhoea! disease in children in the Northern Areas of Pakistan (JPMA 47:12, 1997).

Introduction

In the Northern areas of Pakistan, there is a conurion belief that feeding during diarrhoea increases the frequency of stools and the duration of diarrhoea. Consequently, mothers tend to withold food and this puts children at risk of losing weight. Health education should emphasize the importance of feeding during diarrhoea using locally available and culturally acceptable diets. However, there are no studies on the use of such foods during diarrhoea in the Northern Areas. Recent studies indicate that feeding during diarrhoea decreases the frequency and duration of diarrhoea and improves nutritional status[1-7]. A study in Pakistan reported that a diet of khitchri (rice and lentils) and yogurt given to children with persistent diarrhoea reduced the duration as well as the frequency and volume of stools as compared with soya-based formula, Children receiving khitchri- yogurt also showed substantially greaterweight gain than those on soya formula at the end of the 14 day study period[8].

Khitchri is not commonly used in the Northern Areas, where wheat and corn are the staple diet. Little work has been published on the use of wheat-based diets during acute diarrhoea, although data are available on wheat based-oral rehydration therapy[9]. Dowdo is a wheat-based gruel commonly used in the Northern Areas for children as a weaning food, as well as for adults during illness. There are atlcast seven different recipes for making dowdo. In addition to wheat, ingredients may include milk, dry apricots, apricot kernels, meat and rice. Dowdo prepared with wheat and milk is conunonly used, easily prepared, culturally acceptable and inexpensive. It is considered to be easily digested by children with acute diarrhoea. There is no published information on the nutrient content of dowdo or its effectiveness as a diet for children with acute diarrhoea. Wheat noodles, however, have been reported to be well tolerated and easily digested during recovery from acute diarrhoea[10].

The District Headquarters (DHQ) Hospital, Gilgit admitted 1420 children from 1st January to 31st December 1992, of which 258 had diarrhoea. As there is no special diet for children. they receive the

adult hospital diet, which includes tea and paratha (fried bread) in the morning, milk and egg at 10.00 am and roti (wheat bread) and saalan (spicy vegetable gravy) for lunch and dinner. As this diet is not suitable for small children, it was important to determine if dowdo was an effective diet in children with acute diarrhoea. If so, this food could be encouraged both within the hospital and the community. This study compared milk-based dowdo and khitchri with respect to nutrient content, efficacy (measured by frequency of diarrhoea, amount of stool, duration of diarrhoea and weight gain) and acceptability to mothers and children[2].

Patients and Methods

This study was a hospital-based clinical trial comparing the use of milk-based dowdo and khitchri in children with acute diarrhoea after rehydration. It was carried out at the District Headquarters Hospital, Gilgit between May 11 and December 17, 1993. This 214 bedded hospital with 29 paediatric beds acts as a referral hospital to the three main districts of the Northern Areas. Children between 6 and 36 months of age, with a history of acute non-bloody diarrhoea of less than seven days duration were included in the study. The criteria for exclusion were: exclusively breast fed children, temperature more than 102°F, any systemic illness (e.g., pneumonia, meningitis, congenital heart or other lung disease as bronchial asthma, convulsions), comatosed after rehydration, seizures, paralytic ileus, or third degree malnutrition based on Gomez's classification. Verbal informed consent was obtained from parents of all subjects before they were enrolled in the study. All children seen in the outpatient department who fulfilled the above criteria were admitted to the Paediatric ward for entry into the study.

On admission, a detailed history was taken and physical examination performed. The results were recorded on an admission evaluation form. The degree of dehydration was determined using WHO based Pakistan Control of Diarrhoea! Diseases (CDD) Programme guidelines[11,12]. Dehydration was categorized as no dehydration, mild dehydration and severn dehydration. Nutritional status was assessed by comparing the weight of the child with the expected weight using NCHS weight for age charts[13].

Patients with some dehydration, were rehydrated with ORS and those with severe dehydration with intravenous Ringers lactate over four to six hours. Once rehydration was completed, patients were randomly assigned to one of the diet groups. This was done using a pm-prepared list of computer generated random numbers that indicated whether the child was to receive khitehri or dowdo. These were folded and placed in a basket. The diet was assigned by picking a number from the basket for each child. The dowdo was cooked with 1000 ml of water to the desired consistency, resulting in 1450 grams of cooked dowdo. The khitchri was prepared with 300 ml of water, resulting in a cooked weight of 340 grams (Table I).

Table I. Composition of milk based dowdo and khitchri.

	Ingredient	Amount	Calories	Protein (g)	Fat (g)
Dowdo	Atta*	125 g	462	15.1	2.1
	Cows milk	1000 ml	670	32	41
	Oil	20 g	180	-	20
	Salt	8 g	-	-	-
	Water	1000 ml	-	-	-
	Cooked weight	1450 g	-	-	-
100 g cooked dowdo		-	88	3.2	4.1
Percent of total calories		-	-	14.5	41.9
Khitchri	Rice	59 g	204	4.01	0.3
	Mong dal* (lentils)	30 g	104	7.35	0.4
	Oil	10 g	90	-	10
	Salt	1 g	-	-	-
	Water	300 ml	-	-	-
	Cooked weight	340 g	-	-	-
100 g khitchri mixed with equal wt. of milk		-	92	3.2	3.6
Percent of total calories		-	-	13.9	35.3

Atta: whole wheat flour

*Mong dal: Phaseolus anreus Roxb

The nutrient content of 100 grams of cooked dowdo and khitchri were determined by using food composition tables[14]. Caloric value was also verified by bomb calorimetry (Gallen Kamp Autobomb, CBA-305, England).

A target intake of 110 KcalfKg/day was attempted by offering the diet ad libitum at three hourly intervals. The food was weighed on aTanita food scale, with an accuracy of 2 gms. All the mothers were told that the hospital diet met their children's requirements and were strictly advised not to give additional food except for breast milk. The amount of breast milk given was calculated by test weighing[15], using a Deteeto weighing scale with an accuracy of 20 gms. The stool output was measured by subtracting the previously detennined weight of the diapers from the weight after the passage of stool using a second Tanita scale. The consistency of the stool was recorded as liquid, sethi-liquid, or semi-formed. Urine output was recorded by using urinary bags; however, in some of the female patients, urine was difficult to collect and some mixing of urine with stool was expected. The amount of vomitus was recorded as small (less than a small cup of 100 ml) or large (more than orequalto 100 ml). A record of intake of food, ORS and breast milk and output of stool, urine and vomitus was maintained on a flow sheet, Intake was recorded every 3 hours and output immediately after passage of stool, urine or vomitus, by trained study technicians. They were also responsible to cheek for abnormal findings including signs of dehydration. All changes in patient status were reported to the study physician, who was available within the hospital.

The study physician (S.M.) was responsible for checking all intake and output records examining each child, recording weight, state of hydration and any abnormal findings even twelve hours and one of the other investigators checked the records every 24 hours. Cessation of diarrhoea was defined as passage of two consecutive semi-formed stools or no stools for 12 hours. Patients were discharged when diarrhoea had ceased. Duration of diarrhoea was measured by the number of hours of hospitalization after rehydration. Treatment failure was defined as a need for intravenous therapy more than twice during any 72 hours period, inability to consume more than one quarter of the calorie goal for three

consecutive days, or diarrhoea lasting more than 14 days. Withdrawal criteria included; parental unwillingness to cooperate with the study protocol; development of complications such as pneumonia, seizures, or ileus and inability to manage the patient according to protocol.
Acceptability of dowdo and khitchri was evaluated by administering a questionnaire to the mothers at the end of the study. The questions inquired whether the child liked the diet, quantity consumed, whether it was adequate and the mother was willing to offer it during a subsequent episode of diarrhoea. Darn were entered and analyzed using EPI INFO, Version 5. an analytic software package developed by the 14.3±6.4 Centers for Disease Control and Prevention, Atlanta and 32 WHO, Geneva[16]. Univariate and bivariate analyses were 6 carried out; results are reported as median values since data 3.8±1.5 was not normally distributed and significance testing was 27 carried out by means of the Kruskal Wallis test. The study was 11 approved by the Directorate of Health Services, Northern Areas and by the Harvard Univórsity Ethics Committee.

Results

A total of 78 subjects were recruited. Two patients, one from each diet group, were withdrawn later, either because of a hospital stay of less than 24 hours or due to unwillingness of their parents. The characteristics of the two groups of patients were similar at the beginning of the study (Table II).

Table II. Comparison of pre-study characteristics of children receiving dowdo and khitchri.

Characteristic	Dowdo group (n=38)	Khitchri group (n=38)
Age (months)	13.3±6.0	14.3±6.4
Sex		
Male	27	32
Female	11	6
Duration of diarrhoea (days)	3.8±1.8	3.8±1.5
Stool consistency		
Watery	25	27
Semi-liquid	13	11
Degree of dehydration		
None	17	14
Some	20	21
Severe	1	3
Weaning age (months)	6.8±2.7	7.3±3.0
Weight by age % of expected	79	80.5
Currently breast fed	38	36
Duration of breast feeding (months)	13.3±6.0	12.7±7.2
Use of ORS	26 (68%)	31 (82%)
Health care provider seen prior to hospital admission		
Doctor*	6	9
Quack**	7	3
None	25	26
Drugs used		
Antidiarrhoeal	0	0
Antimotility	0	1
Antibiotic	5	6
None	33	31

*Doctor: Registered medical practitioner holding a MBBS degree.

**Quack: Unregistered practitioner without a MBBS degree.

Of the total of 76 patients, treatment failure occurred in three patients (two in khitchri and one in the dowdo group) because of their inability to consume more than one quarterof the target caloric intake, for three consecutive days.

Table III. Comparison of outcome variables for children receiving dowdo and khitchri (median values).

Day	Variable	Dowdo group n=37	Khitchri group n=37
One	**(24 hours after entry)**		
	Stool weight (g/kg body weight)*	55.8	43.2
	Stool frequency/day	6	7
	Caloric intake/kg body weight	40.2	38.6
Two	**(48 hours after entry)**	n=35	n=34
	Stool weight (g/kg body weight)*	41.4	42.3
	Stool frequency/day	4	4
	Caloric intake/kg body weight	47.9	38.8
Three	**(72 hours after entry)**	n=20	n=20
	Stool weight (g/kg body weight)*	45.8	28.6
	Stool frequency/day	6	3
	Caloric intake/kg body weight	42.1	34.3
Four	**(96 hours after entry)**	n=13	n=10
	Stool weight (g/kg body weight)*	37.1	46.4
	Stool frequency/day	5	5
	Caloric intake/kg body weight	32.0	40.9
Five	**(120 hours after entry)**	n=3	n=4
	Stool weight (g/kg body weight)*	27.6	56.5
	Stool frequency/day	2	3
	Caloric intake/kg body weight	20.7	32.8

*Analysis done only on male children because in females urine was mixed with stool; "n" represents the number of patients included on each day. The number declines as children in whom diarrhoea ceased were discharged from the hospital.

Table III compares the outcome variables for the two groups over a period of five days. There were no significant differences in stool weight per kilogram, stool frequency or caloric consumption per kilogram (median and Kmskal Wallis H pan-meters). Because of possible inaccuracy of measurements of stool weight in female patients due to mixing of urine with stool, this analysis was done only on males.

Table IV. Comparison of variables at the resolution of diarrhoea for children receiving dowdo and khitchri (median values).

Variable	Dowdo group	Khitchri group
Total weight change (g)	150	140
Range	(-500 to +640)	(-440 to +920)
Duration of hospitalization (hours)	69.5	62.0
Range	(19-192)	(20-216)

Table IV compares variables for the two groups at the resolution of diarrhoea. There were no significant differences in the total weight change or total hours of hospitalization (median values).

Table V. Comparison of acceptability of study diets for children 2receiving dowdo and khitchri (n=70).

Parameter (n=34)	Dowdo group (n=36)	Khitchri group	p-value
Does the child like the diet			.02
Yes	27	19	
No	7	17	
Amount of diet consumed			n.s.
Small	8	15	
Large	26	21	
Adequacy of diet			n.s.
Enough	32	28	
Not enough	2	8	
Would you use the diet at home			.04
Yes	31	25	
No	0	0	
Not sure	3	11	

73 were to be evaluated (3 were treatment failures).
3 mothers left before the acceptability questionnaire could be administered.
Statistical Method: Mantel-Haenszel.

Table V compares the acceptability of the two diets. Compared with khitchri, mothers reported that the child liked dowdo more (p=0.02) and that they would use dowdo at home (p=0.04).

Discussion

This study compared two diets with similar nutritional contents, given to children with acute diarrhoea. Khitchri was chosen for comparison with dowdo which is commonly used as a weaning and an acceptable food during diarrhoea in oilier parts of Pakistan[17,18], In addition. khitchri in combination w'ith yogurt has been demonstrated to decrease stool output in children with persistent diarrhoea[6] and was well tolerated in combination with WHO ORS in children with acute diarrhoea[8]. Our study showed that dowdo bad the same impact as khitchri in terms of stool frequency, output and duration of diarrhoea, as well as weight gain in children with acute diarrhoea. These results were obtained inspite of the fact that we used milk rather than yogurt in combination with the cereals in our study diets. However, both diets provided relatively low levels of lactose, 3.3 g/l00 g of dowdo and 2.4 g/100 g of the khitchri/yogurt mixture. Penny et al[19] have reported that lactose levels higher than 6 gfkg body weight/day are not well tolerated in children % with persistent diarrhoea.

The study also indicates that dowdo is superior to khitchri in tenns of its acceptability to mothers and their children. Although the acceptability analysis was based wholly on the mother's evaluation, it has

important implications, as mothers generally will not feed their infants foods with which they are not familiar or which are not acceptable to them. As our study only included those children who had already been introduced to foods other than milk, a more objective assessment of acceptability would have been obtained if the type of weaning foods consumed at home had been enquired. In a study of infant feeding practices in Gilgit. 72% of 162 mothers interviewed, used dowdo as the first weaning food[20].

The total caloric intake of the study children was The study also indicates that dowdo is superior to khitchri in tenns of its acceptability to mothers and their children. Although the acceptability analysis was based wholly on the mother's evaluation, it has important implications, as mothers generally will not feed their infants foods with which they arc not familiar or which are not acceptable to them. As our study only included those children who had already been introduced to foods other than milk, a more objective assessment of acceptability would have been obtained if the type of weaning foods consumed at home had been enquired. In a study of infant feeding practices in Gilgit. 72% of 162 mothers interviewed, used dowdo as the first weaning food[20].

The total caloric intake of the study children was relatively low even when one takes into consideration the fact that children suffering from acute diarrhoea have been reported to show a 30 to 40% decline in food intake for upto 2 weeks post-recovery[21,22]. Dangerous or severe diarrhoea is often attributed by Pakistani mothers to indigestion, over eastmilk[23]. Anorexia in children and the mothers fear that feeding during diarrhoea exacerbates the diarrhoea may have resulted in the low food .04 intake in our study. Therefore, it is crucial to reassure mothers that feeding will not prolong the duration of diarrhoea even if it results in increased stool output during the first few days of diarrhoea[24]. In addition, mothers must be convinced that the child's refusal of food is due to anorexia rather than a dislike for the food and that a great deal of time and patience is required to persuade the anorexic child to eat more.

We conclude that feeding dowdo is as effective as khitchri in children with acute diarrhoea. It can be recommended as a diet for children with acute diarrhoea in both the hospital and the community in the Northern Areas. However, health practitioners need to encourage mothers to use dowdo not only as a weaning food but also forfeeding their children when they have diarrhoea.

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