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Comparative Trial of 'Isomil' and Skimmed Milk in the Treatment of severe Kwashiorkor and Diarrhoea

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Summary

Aderele, W. I.. Effiong, C. E., Seriki, O. and Olatunbosun, D. A. (1977). *Nigerian Journal of Paediatrics*, 4 (2), 27. **Comparative Trial of 'Isomi' and Skimmed Milk in the Treatment of severe Kwashiorkor and Diarrhoea.** A lactose-free soya-based formula, 'Isomil", was compared with the traditionally accepted dried skimmed milk (DSM) in the treatment of 26 children with severe kwashiorkor and diarrhoea. The results show generally good clinical, biochemical and haematological responses which did not differ significantly between the two treatment groups. "Isomil" was however, tolerated less well and vomiting was more common with it than with DSM. The study shows that "Isomil", though more expensive than DSM, has no distinct advantage over the latter and it is therefore not recommended for the routine management of kwashiorkor.

DRIED skimmed milk (DSM) is the recommended diet for managing the acute phase of kwashiorkor (Dean, 1952). Though of low fat content, DSM contains lactose and may therefore worsen the diarrhoea which is usually due to lactose intolerance in these children (Dean, 1952; Bowie, Brinkman, and Hansen, 1963 & 1965). It seems therefore that a lactose-free formula would be ideal in the initial treatment of children with kwashiorkor and diarrhoea. Such a formula is 'SIMILAC ISOMIL' (Abbot Laboratories), a milk substitute formula consisting mainly of soya-bean-protein-isolate, corn flour, sucrose, corn and coconut oils. It also contains vitamins and minerals (including iron). Like DSM, Isomil contains 65 calories per 100 ml of prepared feed.

Because it is lactose-free, 'Isomil' would appear to be an ideal formula to compare with the universally accepted DSM in the treatment of kwashiorkor. The present communication reports the clinical and biochemical responses of 26 children with severe kwashiorkor and diarrhoea to 'Isomil' and skimmed milk feeds.

Subjects and Methods

Subjects for the trial consisted of children admitted with severe kwashiorkor and diarrhoea to the University College Hospital (UCH), Ibadan, during 1973 and 1974. Excluded were children with pneumonia, tuberculosis, or any other intercurrent infections. Children considered suitable for the study were allocated at random to either of two treatment groups. Apart from the type of feed, they all received similar supportive therapy in terms of nursing care, vitamin supplements, and when indicated, antibiotics, local gentian violet paint for skin excoriations, intervenous fluids and blood transfusion. During the period of severe illness one or the other of the

formulas was given in volume varying from 79 to 85 ml (approximately 55 cals/kg/day) to the patients. The initial protein intake amounted to 1.6g and 3g/kg/ day for those on Isomil and DSM respectively. This was later supplemented by semi-solid and solid items of high protein food as the children got better.

Follow-up evaluation during admission included packed red cell volume (PCV), serum proteins (total, albumin and globulin), serum electrolytes and urea which were repeated at weekly intervals, or more frequently when indicated by the clinical condition of the patient. Records kept for each patient included 6 hourly temperature, daily weight, frequency of vomiting, number and consistency of stools, skin changes and presence or absence of oedema.

Results

Thirty-two patients were originally admitted to the study. Six of these were later rejected because of pulmonary tuberculosis (3 cases), bronchopneumonia (2 cases) and osteomyelitis (1 case). Table I shows the age distribution of the 26 children who satisfied the criteria for analysis. The youngest was one year old while the oldest was six. The mean ages were similar in the 2 groups (3.4 years for the 'Isomil' group and 2.8 years for those fed on DSM). There were 4 males and 9 females (male: female ratio of 1: 2.25) in each of the study groups.

Clinical Observations

Vomiting

Skimmed milk was better tolerated than 'Isomil' which was taken reluctantly by several of the children. Five (38.5 per cent) of the 13 children on 'Isomil' vomited for an average period of 4 days, while only one child (8 per cent) on DSM vomited intermittently for about two weeks.

Diarrhoea

All the 26 children who had diarrhoea on admission were free of it within three weeks. Among those on 'Isomil', diarrhoea lasted 2 to 18 days (mean, 9.7 days), while it lasted for 2 to 21 days (mean, 10.3 days) in the DSM group. Although the diarrhoea tended to be more prolonged among those on DSM there was no statistically significant difference between the two groups in the persistence of the diarrhoea ($p > 0.05$).

Loss of Oedema

There was no demonstrable pitting oedema beyond the 19th day (mean, 12.4 days; range, 7–19 days) in the survivors on 'Isomil', while the oedema lasted for 9–19 days (mean, 11.6 days) in those on DSM. The difference between the 2 groups was also not significant. ($p > 0.05$).

Weight

Table II summarizes the weights of the patients both on admission and at the time of discharge. The initial weights include those of all the 26 children admitted to the trial, while the final weights are those recorded when the 20 survivors were discharged from hospital. The mean net loss in weight of 0.4kg in both groups was identical. Because of the pressure on beds, it was not possible to keep these children hospitalized long enough for them to regain their mean admission weight after loss of oedema.

Biochemical and Haematological Values

The laboratory values of blood specimens obtained from the survivors on admission and on discharge are summarized in Table III. There was no statistically significant difference between the groups ($p > 0.05$) in respect of the distribution of Hb genotype, mean PCV, total serum proteins, albumin and globulin, serum electrolytes and urea both on admission and at the time of discharge. The mean haematocrit and all the biochemical values in survivors showed significant improvement in the 2 study groups. The improvement in serum protein (including albumin), serum electrolytes and urea were similar in both groups.

TABLE I

Age Distribution of 26 Children on Milk Trial

Age (months)	*'Isomil'*	*Skimmed Milk*
12–24	0	4
25–36	5	2
37–48	3	4
49–60	1	2
61–72	3	1
73–84	1	0
Total	13	13
Mean age	3·4 ± 1·4 years	2·8 ± 1·4 years

TABLE II

Initial and final Weights of the Children Treated with 'Isomil' and Skimmed Milk

	'Isomil'	*Skimmed Milk*
No. of cases	13	13
Initial Weight (kg)		
Range	5·5–14·5	5·9–14·5
Mean	9·5	9·1
SD	2	2
No of Cases	9	11
Final Weight (kg)		
Range	5·9–10·7	5·6–13·9
Mean	9·1	8·7
SD	2	2

TABLE III

Biochemical and Haemotological values in Kwashiorkor Children fed on 'Isomil' and Skimmed Milk

Milk Formula	*'Isomil'*		*Skimmed Milk*	
	Initial Value	*Final Value*	*Initial Value*	*Final Value*
No of Cases	13	9	13	11
PCV (per cent)	27±6	32±3	27±4	30±2
Hb. Genotype AA	10	–	11	–
AS	2	–	1	–
AC	1	–	1	–
Total serum protein (Gm/100ml)	4.0±0.5	6.1±0.6	4.1±0.6	5.8±0.9
serum albumin (Gm/100ml)	1.4±0.4	2.3±0.4	1.6±0.4	2.4±0.6
serum globulin (Gm/100ml)	2.6±0.4	3.8±0.4	2.5±0.8	2.4±0.6
Serum electrolytes and Urea				
Sodium (mEq/Litre)	132±9	136±4	133±5	136±5
Potassium (mEq/Litre)	3.3±0.7	4.5±0.5	3.4±0.5	4.1±0.6
Chloride (mEq/Litre)	102±7.0	100±3	105±4	104±4
Bicarbonate (mEq/Litre)	21±6	23±2	19±4	21±5
Urea (mg/100ml)	16±7	23±8	16±7	27±8

Note: No statistically significant difference between the values under Isomil and under Skimmed Milk $p \geq 0.05$).

Length of stay in hospital

The mean period of 18.8 days (range, 10–28 days) spent in hospital by the nine survivors on 'Isomil' did not differ significantly from the 17.1 days (range, 8–28 days) spent by the eleven who survived on DSM.

Mortality

Four (31 per cent) of the 13 children on 'Isomil' and two (15 per cent) of those on DSM died during the trial. In all the six children who died, the illness was very severe; hypothermia was present in four and pyrexia in two. Of the four children who died in the 'Isomil' group, one died within 24 hours of admission, two died of previously undiagnosed infection and a fourth had persistence of gross oedema and diarrhoea. One of the children with infection had terminal severe staphylococcal septicaemia, while an autopsy report on the second showed bronchopneumonia (not diagnosed antemortem) with a small quantity of bilateral pleural effusion, fatty degeneration of the liver and pancreatic atrophy. It is possible to suggest that the child with gross oedema and persistence of diarrhoea failed to respond to 'Isomil'. This is, however difficult to prove or disprove. The children on the DSM regiment who died, had pyrexia of undetermined origin; they died on the 3rd and 6th day of admission, respectively. Autopsy was not performed on any of them and the cause of death remains obscure in each case.

Discussion

The results of the present study indicate that 'Isomil', a soya-based formula is as effective as, but not better than skimmed milk in the treatment of severe kwashiorkor and diarrhoea. Although

the mean duration of diarrhoea in the nine survivors on 'Isomil' (9.7 days) was slightly shorter than the 10.3 days for the eleven on DSM, this difference was not significant. Thus it may be concluded that in the management of kwashiorkor and diarrhoea, neither formula has a distinct advantage over the other. Similarly, because the mean periods for complete loss of oedema, mean change in weight, length of hospital stay and biochemical improvement did not differ significantly in the two treatment groups, neither formula can be recommended as the diet of choice. In contrast, vomiting occurred more frequently and for a longer period among those on 'Isomil' than in the DSM group, for while 38.5 per cent of the patients on 'Isomil' vomited for an average of 4 days, in only one child (8 per cent) on DSM was vomiting present intermittently for two weeks. Moreover, many of the children on 'Isomil' took it reluctantly.

Rutishauser and Wharton (1968) have reported similar reactions to toasted full-fat soya-flour by Ugandan kwashiorkor patients. In their study, vomiting was very common and both clinical and biochemical responses were poor in children on the soya-flour formula. Four (17 per cent) of their 15 patients on soya-flour regime failed to respond at all. When however, these four cases were treated with skimmed milk, there was immediate improvement in three of them. They concluded that skimmed milk was the diet of choice in the treatment of acute kwashiorkor. The relatively good results in the present study, compared with the Ugandan study, may have been due to modification of the protein extract of soya-bean and replacement of its fat by more acceptable vegetable oils.

The cost of a formula is an important consideration when one is looking for sources of protein for the management of malnutrition since poverty is an essential contributory factor in protein-calorie malnutrition. The price ratio, weight for weight, between 'Isomil' and DSM is at least 1.5:1. Since 'Isomil' in this study, does not show any distinct advantage over DSM, it is not recommended for the treatment of acute phase of kwashiorkor. After 'initiation of cure' using DSM, a vegetable protein, such as opaque maize (Reddy and Gupta 1974) or soy-ogi (maize/soya-flour), should be recommended since this would be within the financial means of most poor parents.

The overall mortality of 23 per cent in the present study was not higher than in other reports (Lawless and Lawless, 1963; Lawless, Lawless and Garden, 1966; Ifekwunigwe, 1975) It is worthy to note that the patients in this study were very ill on admission. In two patients, death occurred within 24–48 hours when treatment was not effectively established. Three other patients died of severe infection. Only one child died with persistent diarrhoea and oedema. None of these deaths could be attributed to the use of either formula.

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References

Bowie, M. D., Brinkman, G. L., and Hansen J. D. (1963). Diarrhoea in protein-calorie malnutrition. *Lancet.* **2,** 550–551.

Bowie, M. D., Brinkman, G. L. and Hansen, J. D. (1965). Acquired disaccharide intolerance in malnutrition. *J. Pediat.*, **66,** 1083–1091.

Dean R. F. A. (1952). The treatment of kwashiorkor with milk and vegetable proteins. *Brit. Med. J.*, **2,** 791–796.

——(1952). Observations on African children. *S. Afr. Med. J.* **26,** 1.

Ifekwunigwe, A. E. (1975). Emergency treatment of large numbers of children with severe protein-calorie malnutrition. *Amer. J. Clin. Nutri.* **28,** 79–83.

Lawless, J. and Lawless, M. M. (1963). Kwashiorkor. The result of cold injury in a malnourished child? *Lancet.*, **2,** 972–974.

Lawless, J., Lawless, M. M. and Garden, A. S. (1966). Admissions and mortality in a children's ward in an urban Tropical Hospital. *Lancet.* **2,** 1175–1176.

Reddy, V. and Gupta, C. P. (1974). Treatment of kwashiorkor with opaque—2 maize. *Amer. J. Clin. Nutri.*, **27,** 122–124.

Rutishauser, I. H. E., and Wharton B. A. (1968). Toasted full-fat soya flour in the treatment of kwashiorkor. *Arch. Dis. Childh.*, **43,** 463–468.