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Effect of Low Lactose Milk Eiwit Melk (E.M.) on Protein Calorie Malnutrition

by

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Abstract

During 1½ years, from January 1972 until July 1973, 55 P.C.M. children hospitalieed in the Department of Child Health, Medical School, University of Indonesia/Dr. Tjipto Mangunkusumo General Hospital, were involved to this study. Self-prepared ''Eiwit Melk (E.M.)'' containing protein 2.7%, carbohydrate (lactose) 1.4%, fat 2.2% and calories 600, was used. Thirty children were treated with E.M. and 25 children as controlled, i.e. treated with E.M. + lactose 3.4% (E.M.L.).

The results of the clinical trial as expressed with the increase of body weight, were excellent in 85.7% and good in 14.3%, whereas the results in the controlled group were excellent in only 9.1%, good in 36.4% and poor in 54.5%.

From these excellent results, low lactose milk formula might be recommended in treating children with P.C.M.

Introduction

Intestinal biopsy study reveals that abnormal changes in the mucosa (villi) of the upper intestine occur in Protein Calorie Malnutrition (P.C.M.), especially in the severe form (Suharjono at al., 1970). The enzyme lactase is produced and acts in the brushborder of the microvilli. Stanfield (1965) found in only 2 of 11 severe PCM Children, where lactase levels were within the normal range. Lactase deficiency in severe PCM due to a change in villous pattern might cause lactose intolerance.

Nineteen (86.4%) of the 22 children studied in Jakarta suffering from PCM showed flat blood glucose curves following ingestion of lactose (Sunoto et al., 1973). Due to atrophy of the villi of the intestinal mucosa in PCM disaccharidase deficiency may occur which may cause secondary sugar intolerance. So, in treating PCM children, a lactose free or lactose low diet might be more reasonable (Suharjono et al., 1971).

This paper is dealing with the results of our study on the effect of "low lactose milk" on PCM children.

Materials and methods.

During 1½ years, from January 1972 until July 1973, 55 PCM children hospitalized in the Department of Child Health, Medical School, University of Indonesia/Dr. Tjipto Mangunkusumo General Hospital, were involved to this study. We used self-prepared "Eiwit Melk" (E.M.) containing 1.4% lactose. The main composition of this formula 1 L solution is as follows.

— protein   : 2.7%
— carbohydrate (lactose) : 1.4%
— fat   : 2.2%
— calories   : 600

Thirty children were treated with E.M., and as a control of this study we put the other 25 PCM children on "Eiwit Melk" + lactose 3.4% (E.M.-L.) where the main composition in 1 L solution is as follows :

— protein   : 2.7%
— carbohydrate (lactose) : 4.8%
— fat   : 2.2%
— calories   : 736

The other 30 patients were excluded from the trials due to various reasons, i.e. disease detected during hospitalization, such as tuberculosis, chronic diarrhoea, parasitic infestation which could otherwise influence the trial. The others died or were discharged at the request of their parents before the scheduled time of 4 weeks was finished.

The nutritional status was evaluated weekly until approximately 8 weeks of hospitalization. During the entire trial only milk as the sole food was given.

Results

The criteria used for rating growth increase, after the edema has been substracted, are as follows :

Excellent: if the increase of body weight within 1 month (4 weeks) divided by the natural optimal increase reflected by body weight and age is more than one.

Example:

A 1-year-old girl, with a body weight of 5 kg on admission, was hospitalized for 8 weeks. On discharge the body weight was 7 kg, so the average increase of body weight within 1 month (4 weeks) was 1000 gm.
The Indonesian standard of optimal monthly increase of a child with a body weight of 5 kg regarded as a healthy child of the first trimester of age is 750 gm.

$$\frac{\text{Average increase of b.w. (1 month)}}{\text{Optimal increase (1 month)}}$$

$$= \frac{1000}{750} = > 1$$

The result of this child is considered to be *excellent*.

Good : if the ratio obtained according to the above mentioned calculations is approximately 1.

Example:

A 2-year-old boy, with a body weight of 6.5 kg on admission, was hospitalized for 8 weeks. On discharge the body weight was 7.4 kg, so the average increase of body weight within 1 month (4 weeks) was 450 gm.

The natural optimal monthly increase of a child with a body weight of 6.5 kg - regarded as healthy child of the second trimester of age - is 450 gm.

$$\frac{\text{Average increase of b.w. (1 month)}}{\text{Optimal increase (1 month)}}$$

$$= \frac{450}{450} = 1$$

The results is considered to be *good*.

Poor : if the ratio is less than one.

Example :

A 3-year-old boy, with a body weight of 8.5 kg on admission, was hospitalized for 8 weeks. On discharge the body weight was 9.0 kg, so the average increase of body weight was 9.0 kg, so the average increase of body weight within 1 month (4 weeks) was 250 gm. The natural optimal monthly increase of a child with a body weight of 8.5 kg - regarded as a healthy child of the third trimester of age - is 350 gm.

$$\frac{\text{Average increase of b.w (1 month)}}{\text{Optimal increase (1 month)}}$$

$$= \frac{250}{350} = < 1.$$

The result is considered to be *poor*.

Table 1 shows the effect of E.M. on PCM children : excellent on 12

out of 14 patients (81.7%), good on 2 out of 14 patients (14.3%) and poor on none.

Table 2 shows the effect of E.M. on PCM children : excellent on 1 out of 11 patients (9.1%), good on 4 out of 11 patients (36.4%) and poor on 6 out of 11 patients (54.5%).

Discussion

Disaccharidases are found in the brushborder lining the luminal surface of the intestinal epithelium (Miller and Crane, 1961) and therefore are liable to be affected by any disorder where the intestinal mucosa is damaged. Examples of this include protein calorie malnutrition, gastroenteritis and some parasitic infestations.

Normally, lactase is present in a lower concentration as compared with other brushborder disaccharidase (Dahlqvist, 1964). It is also the last completely recovery of the following mucosal damage (Plotkin and Isselbacher, 1964). Consequently, lactase deficiency is the most important type of the secondary disaccharidase deficiency.

Our intestinal biopsy study showed that Jakarta children with severe PCM have notable villous atrophy in the upper small intestine. The incidence of damage in grades II and III was 56.3% (9 out of 16 cases) and in grades IV, V, and VI 43.7% (7 out

of 16 cases) as compared with 10.5% and 89.5% respectively in Kampala for the same grades (Stanfield, 1965).

So, in treating PCM, a lactose low or free diet is recommended. From our present study we had good (43.3%) to excellent (85.7%) results in treating PCM with low lactose milk. From the 12 out 14 cases (85.7% with excellent and 2 cases (14.3%) with good results within one month.

— 1 case showed an increase of 1.600 gm of body weight

— 4 cases showed an increase of 1.100 to 1.500 gm of body weight

— 8 cases showed an increase of 500 to 700 gm of body weight and

— 1 cases showed an increase of 350 gm of body weight.

On the other hand, the results of EML to the other 11 PCM children were for the majority poor (6 out of 11 cases or 54.5%). Only 1 case gave an excellent result, whereas the other 4 remaining cases gave rather good results (36.4%). The increase in body weight within one month of these 11 patients treated with EML varied only from 100 gm to 400 gm. In general, the conclusion drawn from this trial is that low lactose milk in PCM children gives significantly better results and this might be seriously considered in the management of PCM in the future.

TABLE 1 : *Effect of "Low Lactose Milk" * on protein calirie malnutrition children.*

No.	Name	Age (years)	Body weight on admission (kg)	Duration of hospitaliza- tion (weeks)	Hb (gm%)	Alb/glob. ratio	Increase of BW/4w. (gm)	Results E. G. P.
1.	B	$5/12$	3.4	8	10.5	3.15 : 3.30	800	+ — —
2.	D	$1\ 5/12$	4.0	8	9.2	3.25 : 3.15	700	— + —
3.	S	$1\ 1/12$	7.5	12	9.9	2.85 : 2.60	350	— + —
4.	H	$1\ 5/12$	5.0	7	9.9	2.67 : 2.09	900	+ — —
5.	N	2	5.0	12	9.4	2.73 : 3.10	900	+ — —
6.	W	1	5.4	10	9.5	3.17 : 2.66	950	+ — —
7.	S	2	6.4	9	5.4	3.09 : 2.73	1.500	+ — —
8.	S	$7/12$	4.4	9	9.7	2.99 : 2.50	800	+ — —
9.	A	$1\ 6/12$	6.9	11	9.0	2.06 : 2.42	1.100	+ — —
10.	S	$1\ 5/12$	4.7	9	7.4	3.13 : 2.47	1.200	+ — —
11.	J	$1\ 2/12$	6.6	9	7.8	2.76 : 2.65	900	+ — —
12.	D	$1\ 6/12$	4.4	10	9.4	2.24 : 1.95	1.600	+ — —
13.	O	3	5.0	10	8.0	3.18 : 3.32	800	+ — —
14.	M	$10/12$	5.1	4	10.0	3.19 : 2.78	1.200	+ — —

* "Eiwit Melk" (E.M.).

E = Excellent; G = Good; P = Poor.

G = Good

P = Poor

TABLE 2 : *Effect of "Normal Formula Milk" (**) on protein calorie malnutrition children*

No.	Name	Age (years)	Body weight on admission (kg)	Duration of hospitaliza-tion (weeks)	Hb (gm %)	Alb/glob. ratio	Increase of BW/4w. (gm)	Results E. G. P.
1.	A	1 $4/12$	6.5	8	9.9	3.05 : 230	100	— — +
2.	D	2 $5/12$	6.5	7	9.8	3.05 : 2.35	400	— + —
3.	S	4 $6/12$	6.5	4	8.3	2.83 : 2.52	200	— — +
4.	E	1 $6/12$	5.8	5	6.5	3.03 : 2.88	400	— + —
5.	S	1 $6/12$	7.6	4	10.0	2.24 : 2.63	400	— — +
6.	D	1 $3/12$	6.6	8	9.2	2.83 : 2.57	750	+ — —
7.	M	2 $6/12$	5.7	5	7.9	3.11 : 3.18	340	— — +
8.	S	1 $1/12$	5.6	8	5.6	2.32 : 2.77	300	— — +
9.	T	1 $6/12$	7.0	3	7.0	3.18 : 3.22	+	— — +
10.	M	1 $5/12$	6.7	8	10.0	2.98 : 2.57	400	— + —
11.	A	2	6.8	6	7.8	2.32 : 2.65	500	— + —

** "Eiwit Melk" + lactose (EML)

E = Excellent

G = Good

P = Poor

REFERENCES

1. DAHLQVIST, S.: Method for assay of intestinal disaccharidases. Analyt Biochem 7 : 18 (1964).

2. DE HAAS, J.H. and MEULEMANS, O. Melk in het bijzonder als Zuigelingenvoedsel, tweede druk (1940) Batavia.

3. MILLER, D. and CRANE, R.K.: The Digestive function of the ephithelium of the small intestine. Biochem. et biophys. Acta 52 : 293 (1961).

4. PLOTKIN, G.R. and ISSELBACHER, K.J.: Secondary disaccharidase deficiency in malabsorption states. N. Engl. J. Med. 27 : 1033 (1964).

5. STANFIELD, J.P., HUTT, M.S.R. and TUNNICLIFFE, R. : Intestinal biopsy in Kwashiorkor. Lancet ii : 519 (1965).

6. SUHARJONO, SUNOTO, ASWITHA DAMAJANTI, SADIKIN DARMAWAN and COTTOM, D.G.: Small intestine biopsy in Protein Calorie Malnutrition and Celiac children. Paediatr. Indones. 11 : 75 (1971).

7. SUNOTO, SUHARJONO, CYSCA, LEMBONG, ASWITHA BUDIARSO and SAMSUDIN: Lactose loading test on PCM children. Paediatr. Indones. 2: 13 (1973).