

Study on Weaning Pattern and Nutritional Status of Infants and Toddlers in Korea

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INTRODUCTION

Recent work tends to suggest that environmental influences are of great importance on growth and development of the children.¹⁾ The influence of nutrition in early life on physical growth as well as mental development has been thoroughly discussed in the profession.^{2,3,4)} Certainly, the physical dimensions of the body are much influenced by nutrition, particularly during the period of rapid growth in early childhood. It is indicated that permanent impairment of the central nervous system may result from dietary restriction or imbalance during certain periods of life.^{5,6)}

If children under three years of age show a good nutritional status, it may be assumed that the whole community is well nourished.

It is important to have as much detailed knowledge as possible of the foods actually taken in the community,^{1,3,7)} both for assessing nutritional status and for discovering the dietary ecological factors⁸⁾ that may be correctable.

There have been sporadic surveys conducted to assess the nutritional status and dietary pattern of the people in the rural and urban areas.^{9,10,11,12)} These surveys, however, do not indicate in detail the dietary pattern of infants and toddlers, and few studies covered the entire country.

Therefore this study was made to determine the actual food eaten by the children under three years of age and to observe the nutritional status of the children throughout the nation. A cross-sectional study of infants and toddlers was undertaken to observe the food-intake and nutritional status combined with the anthropometric measurements.

OBJECTS AND METHODS

Several representative areas were sampled on a nation-wide basis by geographical characteristics, and a total of 304 children under three years of age underwent the present study. They were distributed as shown in Table 1, and grouped by age and sex as in Table 2.

An attempt was made to cover the possible seasonal differences in nutrition and food patterns,^{3,11)} performed during both spring and autumn. This study consisted of two main parts, dietary survey and anthropometry.

Using the simplified rapid technique, certain qualitative data were collected about infants and toddlers through the interview toward mothers.

Mothers were questioned on the type of food given to their children, to find out the child-feeding pattern. The obtained data were processed on a master table, grouped by half year of age group.

Measurements of weight, height and arm circumference were conducted. Children were weighed on a baby scale in minimal light clothings. Two types of linear measurement were employed, height of the whole baby and arm circumference.

For measurement of the arm circumference, a flexible steel tape was placed gently but firmly at mid-point around the left upper arm, while hanging freely by the side. The pressure was made constant by the tension of the spring of the tape while extending it. Child mortality and diarrhea incidence were investigated by interviewing the mother.

Table 1. Sample Size and Subjected Areas.

Geography	No. examined	Locality
Urban	70	Resettlement flat, Seoul
Town	50	Kongju, Chungchong Nam Do
Plain	76	Wanju & Kaejong, Cholla Nam Do
Mountain	89	Muju, Cholla Puk Do
	38	Chunsung, Kangwon Do
Island	19	Modo, Kyunggi Do
Total	304	

Table 2. Age Distribution by Sex.

Sex.	Age in month	0~5	6~11	12~17	18~23	24~29	30~35	Total
Male		24	45	51	21	20	13	174
Female		16	26	37	24	15	12	130
Total		40	71	88	45	35	25	304

Table 3. Percentage of the Weanling by Month.

Age in month	No. examined	No. weaned	Percent weaned
1~7	57	0	0
8~11	54	6	11.1
12~17	88	9	10.2
18~23	45	23	51.1
24~29	35	17	48.6
30~35	25	21	84.0
Total	304		

RESULTS

One baby lived on cow's milk, and all the others were breastfed up to seven months. There were 6 weanlings at 8-11 months. Among 88 children, aged 12~19 months, 9 babies were weaned.

At 30~35 months, 21 children out of 25 babies have been weaned (see Table 3).

Average frequencies of different foods taken are presented in Table 4.

Infants aged 0~5 months were breastfed, on an average of 4.7 times or more per child per day, and 6~11 months 4.3 times a day. Children after 12 months were given breastfeeding 3.8 times a day by 17 months. From 18 through 29 months, they were fed breastmilk 1.8 or 1.7 times a day (Table 4). Urban areas show a frequency of 1.1 times at 18 months, and in towns and island groups mother stopped breastfeeding at about 30 months.

Rice was given 0.3 times a day to 0~5 months old infants in plainfield areas. It was taken 1.2 times in average by 6~11 months old infants. They were fed 2.3, 2.5, 2.7 and 2.8 times per day to the successive six-month age groups, respectively.

Oils were given 0.1 time a day to the all age groups except 0~5. They, however, at 18 to 23 months, took oils once every other day, mostly "a few drops".

Infants were fed the soups 0.1 or 0.2 times a day; 12~17 months old children had these once every other day, at 18 to 23 months, they had 1.2 times, and thereafter 1.3 times a day.

At the second half of infancy, they were fed fish 0.1 time a day, and the frequency increased 0.4, 0.6 and 0.9 with the successive age groups, respectively (Table 4).

The average number of times of various meat, such as beef or pork, chicken or egg, taken per day was an average of 0.1 throughout 6 to 29 months.

Cow's milk was taken once every other day at 0~6 months, 0.2 times by the children of 6~11 and 12~17 months, few in 16 through 29 months, and none at 30th month or later.

Number of times of vegetables taken per day per child increased from 0.1 through 1.9 with increasing age.

Seasonings were universally taken by all the age groups, 0.1 to 0.6 times per day per child. All the young children were fed sweets such as bread, biscuit and candy, and others like vitamins, etc., 0.2 to 0.8 times a day by every age group.

Measurements of height, weight and arm circumference were given to each child. The results expressed as the average mean value with standard deviation are presented in Table 5.

Height of male infant aged one month was 55.7 cm, and male children 13 to 16 months of age revealed 74.9 cm.

At 12 to 14 months, male children weighed 9.61 kg average. Two months old female infants weighed 5.13 kg and their height was 55.5 cm in average.

At 21 to 23 months, the height was 77.9 cm and the weight at 21~24 months was 9.66 kg in female.

Arm circumference of one month old male infant was of 11.63 cm. Infants of two to three months revealed 12.60 cm in male and 11.90 in female. At 18 to 23 months, it was 13.77 cm and 13.61 cm in male and female, respectively.

A total of 316 live-births was collected from 178 mothers having 1~3 live-births. Fourteen children out of 316 live-births were dead, giving 4.3 percent of child mortality.

On the other hand, 117 mothers who had experienced deliveries of 4 or more live-births informed 16.5 percent of child mortality. The child mortality calculated from 295 mothers

Table 4. Average number of times different foods taken per day.

Food	Locality	Age in month	0~5	6~11	12~17	18~23	24~29	30~35
Breast-Milk		Urban	4.9	4.0	4.1	1.1	0.7	0.2
		Town	4.7	3.9	3.6	1.4	1.6	—
		Plain	4.7	4.4	4.1	1.3	2.2	2.3
		Mountain	4.9	4.5	3.4	2.6	2.1	0.4
		Island	2.5	4.8	4.3	2.0	2.5	—
		Average	4.7	4.3	3.8	1.8	1.7	0.4
Rice		Urban	—	0.7	1.8	2.5	2.4	2.5
		Town	—	1.5	2.3	3.0	2.9	3.0
		Plain	0.3	1.1	2.4	2.5	2.7	3.3
		Mountain	—	1.3	2.5	2.4	2.9	2.7
		Island	—	1.5	2.6	3.0	2.5	3.0
		Average	0.1	1.2	2.3	2.5	2.7	2.8
CHO*		Average	—	0.2	0.3	0.4	0.3	0.2
Oil		Average	—	0.1	0.1	0.5	0.1	0.1
Soups & Soybean products		Urban	—	0.4	0.4	0.8	1.0	1.0
		Town	—	0.2	0.3	1.6	1.6	1.9
		Plain	0.3	0.1	0.6	1.3	0.8	0.3
		Mountain	—	0.1	0.7	1.4	1.7	1.7
		Island	—	—	—	—	—	—
		Average	0.1	0.2	0.5	1.2	1.3	1.3
Fish		Urban	—	—	0.1	0.6	0.3	0.2
		Town	—	0.3	0.5	1.4	1.1	1.1
		Plain	—	0.1	0.6	1.5	1.0	0.3
		Mountain	—	0.1	0.3	0.2	1.3	0.3
		Island	—	0.3	0.6	—	0.5	0.5
		Average	—	0.1	0.4	0.6	0.9	0.5
Meat & Egg		Average	—	0.1	0.1	0.1	0.1	—
Milk		Average	0.5	0.2	0.2	0.0	0.0	—
Vegetables, Fruits & Sea-weeds		Urban	0.1	0.5	0.9	1.4	1.3	0.8
		Town	—	0.4	0.3	0.6	0.5	1.6
		Plain	—	0.5	1.1	3.0	1.5	3.0
		Mountain	—	0.4	0.7	1.3	2.3	2.4
		Island	—	0.3	0.4	3.0	0.5	2.5
		Average	0.1	0.5	0.8	1.6	1.4	1.9
Seasonings		Average	0.1	0.4	0.6	0.5	0.2	0.4
Sweets & Others		Average	0.5	0.2	0.5	0.8	0.7	0.6

*Potatoes, noodles and other grains carbohydrate sources.

Table 5. Anthropometric Measurements of the Infants and Toddlers, sex separate.

A.C.*	S.D.*	Male				Age month	Height	Female						
		Weight	S.D.	Height	S.D.			S.D.	Weight	S.D.	A.C.	S.D.		
11.63	0.17	4.85	0.26	55.7	5.5	1								
12.60	0.12	5.38	0.51	53.4	1.1	2	55.5	—	5.13	—	11.90	0.62		
		6.98	0.71	59.9	2.7	3	57.1	—	5.85	—				
13.70	1.04	7.05	—	64.1	—	4	61.0	2.5	6.57	0.42				
		8.07	0.80	65.1	2.1	5	64.4	1.2	7.04	1.16	13.46	0.58		
				67.5	3.5	6								
14.05	1.29			67.9	1.2	7	66.2	1.7	7.54	0.27				
				69.1	3.9	8					13.64	1.51		
14.13	0.99	9.85	1.52	75.3	4.0	10	68.8	4.2	8.25	1.01				
								11					13.77	1.20
14.13	1.25	9.85	0.98	75.7	4.2	12	70.7	3.4	8.73	1.45				
				9.61	1.06	74.9	3.0	13~14	72.8	6.6				
						74.9	2.3	15~16	73.5	3.4	9.61	1.10	13.81	1.13
13.77	1.02	10.08	1.47	76.6	4.7	17	75.5	5.3						
								18			9.65	1.55	13.61	1.14
13.93	1.16	11.64	1.61	76.9	6.1	19~20	75.7	4.4						
				80.5	5.1	21~23	77.9	4.5	9.66	0.78				
14.74	0.84	12.34	1.09			24								
						82.7	3.9	25~26	80.0	4.1			13.90	0.99
14.74	0.84	12.34	1.09	83.2	3.2	27~29	83.3	3.1	11.25	1.02				
				83.8	4.1	30~32	83.9	6.7	11.49	1.56	14.06	0.83		
				87.6	3.1	33~35	84.5	5.2						

*A.C.: Arm Circumference, S.D.: Standard Deviation

Table 6. Child Mortality Rate in the Family by interviewing mother.

Locality	1-3 live births		4 live births or more		Total	
	Number interviewed	Dead/birth live (%)	Number interviewed	Dead/birth live (%)	Number interviewed	Dead/birth live (%)
Urban	58	5/118 (4.2)	11	3/49 (6.1)	69	8/167 (4.6)
Town	19	0/44 (0)	26	20/135 (14.8)	45	20/179 (11.7)
Plain	43	4/82 (4.9)	31	32/172 (18.6)	74	36/254 (14.2)
Mountain	45	5/96 (5.2)	43	35/213 (16.4)	88	40/309 (12.9)
Island	13	0/20 (0)	6	10/39 (25.6)	19	10/59 (17.0)
Total	178	14/316 (4.3)	117	100/606 (16.5)	295	114/924 (12.3)

interviewed in the present study was 12.3 percent as a total (Table 6).

Table 7 presents incidence of diarrhea among the 304 children examined. About 20 percent of them revealed as having diarrhea at the time of the study.

Table 7. Incidence of Diarrhea, interviewed with mother.

Locality	No. examined	Per cent rate
Urban	70	18.6
Town	50	20.0
Plain	76	21.1
Mountain	89	19.1
Island	19	21.1
Total	304	19.7

DISCUSSIONS

In many areas of the world today, malnutrition, especially affecting young children is one of the principal public health problems.^{1,3)}

The principal aim of the nutritional assessment of a community is to define the nutritional problems in the area, and to discover and analyse ecological factors that are directly or indirectly responsible, to set base lines as a public health problem.

The present study is concerned with the feeding patterns and assessing the nutritional status of infants and toddlers on a nation-wide scale.

All of the infants were breastfed in the present study up to seven months. But one case was fed on cow's milk.

Ten per cent or around of the 8~17 months old babies were finished breastfed. At the age of 18 to 29 months, the children have been weaned at about 50 per cent. After 30 to 35 months, 84 per cent of them was completed the weaning process. Lee et al.¹⁴⁾ reported that 55 per cent of the children at a farming area began the weaning before 12 months, and 96 per cent finished the process by 18 months. Up to six months, a baby can be adequately nourished on breastmilk. After this age, breast milk alone is not an adequate food to provide sufficient amounts of all the nutrients needed to maintain growth.

When a baby is about six months old, he begins to need other foods as well as breastmilk. Around this time it is important that he should be started mixed feeding. The period between introducing mixed feeding and ceasing breastfeeding called "weaning period" is a time of particular importance to the child.¹⁵⁾¹⁶⁾ There is no absolute rule about the weaning process. However, that breastmilk alone is adequate up to six months can not be accepted without question. Studies have shown that the quantity of breastmilk secreted diminishes as time goes on, and it is imperative that this reduced supply must be compensated by increasing the quantity of supplementary food.¹⁶⁾

Weaning assumes considerable significance from the nutritional point of view. Weaning must be a gradual process. The frequency of breastfeeding can be gradually reduced and the child completely weaned with access to an adequate, nourishing diet.

Children in the present study were breastfed around 4 times a day until 17 months of age, and then the frequency declined to less than 2 times daily at about the 18th month abruptly. At about the 30th month, the babies were nearly no more breastfed (Fig. 1). It could be said that not "gradual weaning" but "cutting breast-feeding" was prevalent in this study. The reasons for

delayed weaning could be attributed to the fact that no baby food is readily available and awareness of the importance of weaning is lacking.⁴⁾

Supplementary feeding serves directly to improve nutritional status and prevent malnutrition.³⁾ It should normally begin at three or four months of age. This is partly because breastmilk is liable to become inadequate for all the infant's needs between three and six months of age, and partly to accustom him to a good variety of foods by six months.³⁾

The growth rate of babies fed on a variety of foodstuffs is superior to that of children subsisting on a single foodstuff.¹⁶⁾ Currently, supplementary feeding is too little, too low in protein and vitamins and begins too late. Prolonged breastfeeding should not be continued as the only diet but always together with other foods.^{17,18,19,20)} In fact, beyond six months, the breastfeeding should be served as the supplement to the solid food.¹⁷⁾

Prolonged breast feeding beyond 12 months will supply invaluable extranutrients at low cost.^{3,19)} Present WHO policy is to prolong breastfeeding for at least twelve months and up to two years.¹⁷⁾ Of course solid feeding of the infant must not be neglected.

Establishment of an adequate and balanced diet by six months minimizes malnutrition in the second half of infancy and also among toddlers.³⁾

In general, one supplementary food will be adequate from 2~4 months, two from 5~6 months and thereafter three or four small meals daily will be acceptable. Children 1~2 years old need about 5 small meals daily, aged 2~3, 4 meals; after 3 years, 3 meals. The baby is ready for weaning when he can take family foods adequately. They reported that supplementary feeding was begun around 6 to 15 months. Merely portions of the one or two meals from adult diet are insufficient for the growing infant. Rice is the most widely eaten staple food.

Boiled rice, not different from the ordinary adult food in the family,¹⁴⁾ was taken as early as 0~5 months in the plain area. Between 6 and 11 months, infant was fed 1~2 times daily.

As shown in Fig. 1, it is taken twice a day or more at 12 months, and increased thereafter to nearly 3 times a day. Rice is not enough as sole source of protein for children in the first three years of life.³⁾ Wheat flour, noodles, potatoes or other carbohydrate source grains were also given to the late infancy and toddler age groups. It is recommendable that other grains are used as supplementary food for babies.²¹⁾

Infant of 0~5 months age group were given cow's milk and sweets once every other day (Fig. 1). The use of dairy products is not traditional in this country, but has increased greatly in recent years.

Vitamins A, C and D are commonly lacking in the basic milk diet of the human infant.²²⁾ Complementary feeding by cup and spoon, rather than by bottle, is preferable.³⁾ Bottle-feeding is dangerous^{17,20)} for the baby, difficult for the mother, and expensive for the father.

Protein is usually the critical nutrient in infant food.²³⁾ Research has shown that balanced mixtures of vegetable protein are just as good as animal protein. Furthermore, when diets are sufficient in calories but marginal in protein, even second-class proteins are apparently utilized more efficiently in the poorly nourished.³⁾

The vegetable foods rich in protein are chiefly dried grain legumes. Soybean is one of the most widely available and cheapest sources of vegetable protein²⁴⁾ and extensively used in the

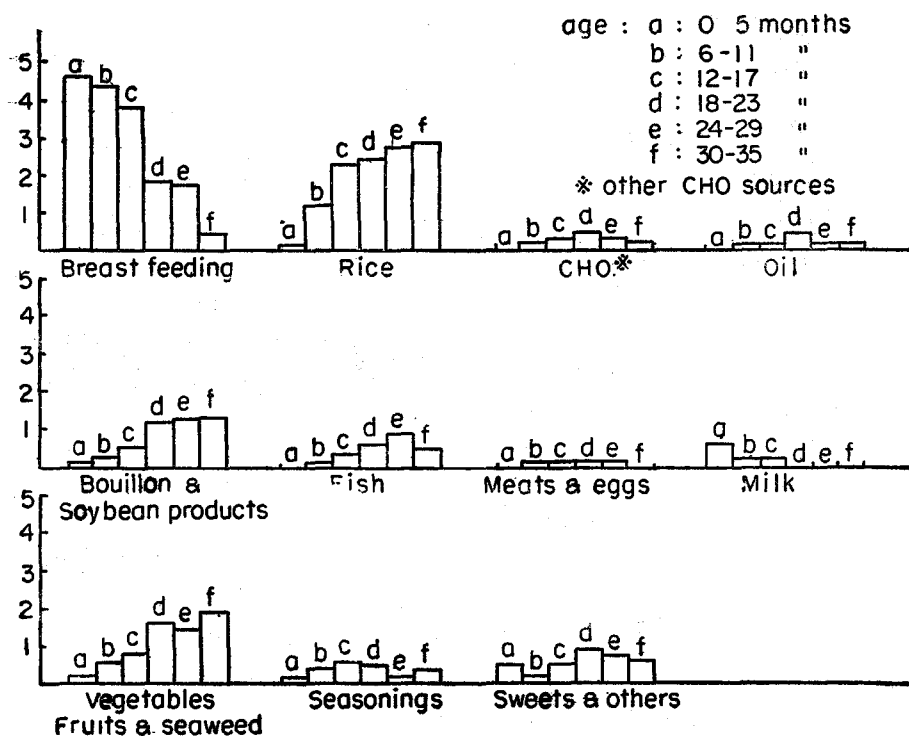


Fig. 1. Frequency Distribution of Food Intake per Day.

whole country. Dried beans need special preparation, soaking overnight and boiled.^{3, 25)} They contain about as much energy as cereals, but seemed seldom eaten insufficient amounts.¹¹⁾

Traditional fermentation processes are commonly employed in the present study. Children are fed in form of thin soup seasoned with soybean paste. These soups should be much more condensed than the present adult ones. Soybean products made by household methods were satisfactory for infants.

After heat-treatment, grinding or pounding the dried beans to a flour, soups are mostly prepared of fermented soybean paste in thin or thick soups with various foodstuffs in it. And then making a porridge together with rice flour or others is recommended.¹⁹⁾

Soybeans also contain considerable amounts of oil.³⁾ Soybean products were mainly soybean curd. It was seen usually in the whole country.

Use of animal food stuffs seemed to be very inactive (Fig. 1). Small dried fish was sometimes used in preparing soups. Their contributions as sources of animal protein supply seemed to be very insignificant.

Anchovies are the most readily available and reasonably cheap form of animal protein. They were available in nearly all parts of the country, even at the isolated, remote mountainous areas. Small soft fish eaten the whole are extremely rich in protein and calcium.¹⁷⁾ The small fish can also be pounded to fine flour. They are recommended for infants and toddlers, mixed with any porridge,²⁷⁾ soup or other food being prepared.

As shown in Fig. 1, meats and egg were found to be playing rather minor roles. Beef was

occasionally taken in the form of bouillons. Eggs are widely available all over the country and recommended for infants and toddlers.

Other excellent and cheap supplementary foods that may be administered are green vegetables.³⁾ Food consumption tables show that dark green leafy vegetables are extraordinarily rich in many nutrients.²⁹⁾ Vegetables can easily be prepared for infants. Vegetables including "Kimchi", pickled cabbage or radish, fruits, seaweeds and other greens were available all the time throughout the study. "Kimchi" seems less nutritive for children.

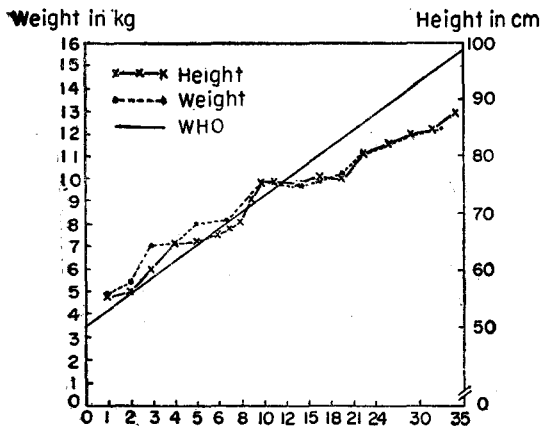


Fig. 2. Comparison of weight and height(male).

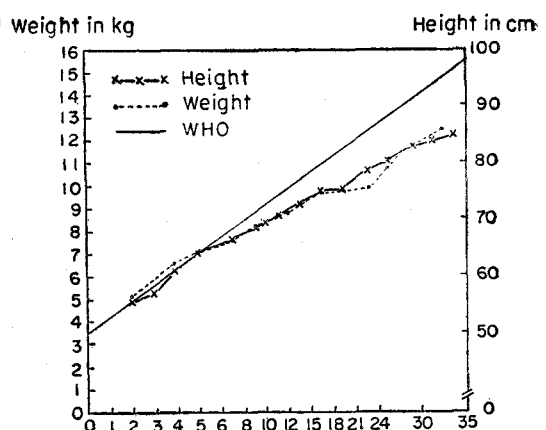


Fig. 3. Comparison of weight and height(female).

Green leafy vegetables are popular everywhere in the country. Strong suggestion is given to take far more much green leafy vegetables, especially spinach. Some varieties of fruit are grown in the country. They are mostly eaten raw, and their vitamin C content is therefore not lost in cooking. Most fruits contain useful amounts of iron.³⁾

Juice of fresh fruit serves to supplement some of the protective nutrients not present in sufficient amount in breastmilk. The small amounts of protective nutrients contained in breastmilk are sufficient in the early months of life, but the baby's needs cannot be met from this source later on.¹⁶⁾ It is recommended therefore that the baby is provided with fruit juice such as tomatoes, apples etc., as a supplement beginning around the sixth month of life.

Seaweeds were extensively used in many parts of the country traditionally. They are important sources of iodine in the diet, and some other minerals, carotene and vitamin C.³⁾

Small quantity of oil, even drops, as a daily supplement to the diet will provide some important protective nutrients needed for growth and development of the baby. Vegetable oil commonly used was sesameseed's. As presented in Fig. 1, the frequency was, however, too small to meet nutritive needs. Fish liver oil is recommended to be given to the baby around the sixth month of life or preferably a little earlier, if taste is acceptable.

Ingestion of seasonings, mostly soy-sauce, was quite a lot (Fig. 1). They were consumed as early as at 0~5 months. The impression was that the babies were fed rice and salt-sauce.^{30,31)}

Some malnutrition is bound to arise if supplementary feeding is delayed. Balanced supplementary feeding is reasonably possible throughout the country.

Nutritional factors have an influence on weight and height. Children can recover from the deprivation, if not too prolonged nor at the critical period.^{2,6)}

In order to examine the developmental state of infants and toddlers, a physical check up including measurements of height, weight and arm circumference was given to each child.

Nutritional anthropology is concerned with the measurement of the variations of physical dimension, the gross composition of the human body at different age levels and the degree of nutrition. Growth is influenced by biological determinants and by environmental factors, above all, by the plane of nutrition.¹⁾ A comparison between average height and weight and WHO standard was made by age, and presented in Figs. 2 and 3. The anthropometric results revealed that, infants between 0 and 5 months are superior to or nearly identical with (WHO standard) in weight and height in both sexes, but thereafter inferior to the standard.

Height of male infant increased gradually through 12 months, with a plateau of growth curve from four to eight months. Height measurements of male children 12 to 16 months old revealed stationary, and thereafter increased less proportionally than before (Fig. 2). Weight of male children at 12 to 14 months dropped down weights at 19 months and 33 months are 1.7 kg and 2.7 kg less than those of WHO, respectively. And the height at 34 months is 8.4 cm shorter than WHO standard. A protruded peak of the male growth curves are around 10 months is thought to be due to the small sample size. Measurements of female children were a little less than those of male children, showing a pattern of smoothly increasing, but with less degree than the standard of WHO (Fig. 2). The height at 34 months is 10.5 cm shorter than WHO standard and the weight at 23 months was 3.2 kg less than WHO average.

The WHO standard^{1),3)} of body weights and heights and the Koreans data of other investigators^{10, 12, 32, 33, 34, 35, 36, 37)} were compared with the observed body weight and height through the present study. Results of these measurements vary from one another to some extent. Growth pattern of the youth is changeable and better weaning diet and improvement of nutrition can provide the maximum growth.³²⁾ The arm circumferences of male children at 13 to 17 months were stationary and dropped down at 18 to 23 months in both sexes, and thereafter increased again.

Malnutrition scores for height, and arm circumference were determined for each sex separately and for the two combined. A simple method is to compare each measurement directly with the standard for a child of the same age.

The malnutrition score was established for each indicator;

Score 0 : 90~100% or more of standard;

1 : 80~89%

2 : 70~79%

3 : 60~69%

4 : below 60% of standard.

This score is useful for cross-sectional survey, to find out age group that appears to be more definitely malnourished.³⁾

Average malnutrition score for the children was calculated in Tables 8, 9, & 10:

For the measurement of heights, about six per cent of the total examined belonged to the score 1 (80~89% of the standard.³²⁾ Kang & Kim³⁴⁾ reported 9.1% in some underprivileged rural areas. The present study showed 17.1% at the age of 18 to 23 months. No children were found less than 80% or below in height measurement of this study. Weight has been the anthropometric measurement most in use. Whether the infants and toddlers get adequate nourishment or not is often assessed by following the gain in body weight.¹⁶⁾

Per cent rate of underweight belonging to the malnutrition score 1, 2 and 4, was 11.2 in total. Twenty-seven cases (8.9%) belonged to score 1, four cases (1.3%) to score 2 and three cases (1.0%) belonged to score 4. (see Table 9). Kang and Kim's³⁴⁾ percentages were 17.2, 12.1, 13.4 and 12.1 in scores 1 through 4 respectively. The malnutrition scores for weight in the present study revealed that the highest rates were at the age groups of 6~11 and 18~23 months, 14.3 and 14.0 per cent, respectively. Table 10 shows the malnutrition scores of the arm circumference measurement compared with WHO standard. Measurements of the mid-upper arm circumference appear to be the most useful in practice. Arm circumference has been shown to be much reduced in all severe forms of protein calorie malnutrition of early childhood.¹⁾ Score 1 is not presented in this study because there is no Korean standard of the arm circumference, but a few data.^{34,35)} Male under 3 months of age was superior to the standard, but thereafter it remained inferior to the standard throughout. At 18 to 23 months, the circumferences of male and female abruptly declined, to be about 2.4 cm shorter than the standard. Malnutrition score 2 was 7.6%, score 3 was 0.3% and score 4 was 0.7%, for a total malnutrition scores for the measurement of arm circumference was 8.6% about 16.7% of the 18~23 months and 13.9% of the 24~29 months were score 2 or below.

Relatively high malnutrition score for weight measurement would suggest caloric deficiency, while high malnutrition scores for height and arm circumference also would suggest some protein deficiency as well.³⁾ Therefore, present study suggests caloric deficiency for the infants and toddlers.

There observed two cases of severe malnutrition throughout this study. Both of them were at Muju, Cholla Puk Do, an isolated remote mountainous area. One case was 20 months old girl and showed some signs almost simulating Kwashiorkor.²⁰⁾ Her development was very poor. She

Table 8. Number of Cases less than 50%(Score 1) of Korean Standard Height.

Age in month	No. of Cases	Urban	Town	Plain	Mountain	Island	Total(%)
		69	50	75	88	19	301
0~5	40						
6~11	71		1	1			2(2.8)
12~17	88	2	1		1		4(4.5)
18~23	41	3	1		3		7(17.1)
24~29	36		1	1		1	3(8.3)
30~35	25			1	1		2(8.0)
Total (%)	301	5 (7.3)	4 (8.0)	3 (4.0)	5 (5.7)	1 (5.3)	18 (5.9)

was 67.9cm tall (score 1) and weighs 5.9kg (score 3), and her arm circumference measured 8.5cm, only half of the WHO standard. Her hair was discolored and sparse, and lower legs presented moderately pitting edema. She took three rice meals with soups seasoned with soybean paste and was breastfed once a day. Her mother was six months pregnant at that time with pretibial pitting edema, and very low in intelligence.

Another 13 months old girl was measured 63.0 cm tall (score 2), 4.7kg in weight (score 4) and 8.7 cm of arm circumference (50% of WHO standard, score 4).

She would be diagnosed nutritional marasmus.^{20,34} Some authors reported that malnutrition might influence morbidity and mortality rates and subsequently life expectancy of regional population.^{1,38} Morbidity and mortality might therefore be considered as one of parameters of the nutritional status of the community.

A correlation between high mortality in toddlers and poor nutritional status in various communities was noted.³⁹ More recently, studies have indicated that the mortality rate in the second year of life is a more specifically sensitive indicator of nutritional status.^{3,40} The toddler mortality rate, therefore, has equal importance with infant mortality,³ while the latter has long been used as indicator of the health of a community.⁴¹ Particularly in developing countries, toddlers are very likely exposed to poor nutrition from delayed weaning combined with inadequate food intake.

In the present study child mortality¹⁹ obtained by interviewing with mother in families with 1~3 live births was 4.3 per cent while that with 4 or more live births was 16.5 per cent. Central Africa, it was about 24 per cent and more.⁴⁰

A total child mortality rate of the present study (12.3%) is about 2 times as great as the infant mortality rate.^{3,41} Malnutrition is an important contributory cause of morbidity. Relationship of morbidity to the feeding patterns of children has been described.⁴² Diarrhea is one of the principal causes of death among young children.¹

The diarrheal disease seen at this period of life is considered as a syndrome, "weanling diarrhea", resulting from the interaction of alimentary infection, poor nutrition and an indigestible irritant diet.^{23,48}

As presented in Table 7, incidence of diarrhea in the present study was 19.7 per cent. The high incidence rate during the second year of life was emphasized.⁴⁰

Well controlled feeding trials with proper supplementary feeding can reduce morbidity and mortality from weanling diarrhea.³ There is often a vicious circle with diarrhea and the nutrition.²³ Improper method of infant feeding may induce diarrhea. The subsequent diarrhea may cause malnutrition, and eventually raise the mortality.

CONCLUSIONS

For the purpose of ascertaining the nutritional status of infants and toddlers, including qualitative childfeeding pattern, this study of 304 children under three years of age, was conducted countrywide in the fall of 1969 and the spring of 1970.

The following conclusions were drawn:

- 1) All of the infants were breast fed up to 7 months. About 10% and 50% of the children

were finished breastfed at 8~17 months and at 18~23 months, respectively. At 30~35 months, 84% of the babies has been weaned.

2) Children were breastfed about 4 times a day at 0 through 17 months of age; 2 times at 18 to 29 months; but breastfeeding almost stopped abruptly after the age of 30 months.

3) Although supplementary feeding was given to the babies, the type of foods administered was unsuitable for them. No fundamental difference was found between the food consumed by adult and the fare provided for the baby.

4) It was observed that prolonged breast-feeding was continued as almost the only diet, without other foods. Beans, small dried fish, vegetables, and oil were not so early started as could.

5) Infants were relatively normal in their growth rate during the first four to six months of life. Beyond this growth retardation becomes apparent in both sexes. A standard technique of measuring the arm circumference was presented.

6) The arm circumference of male children under 3 months of age was quite fair.

7) Malnutrition score was 5.9% for height, and scores 1, 2 and 4 for weight were 11.2%. For arm circumference 8.6% belonged to scores 2, 3 and 4. Calorie deficiency is suggested by the relatively high malnutrition score for the weight measurement.

8) One case of the severe form of protein-calorie malnutrition was found. Another case was nutritional marasmus.

9) The child mortality rate with 1~3 live births was 4.3% and that with 4 or more was 16.5%, for a total average of 12.3%. The incidence of diarrhea was 19.7%.

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<국문초록>

한국 영유아기에 있어서의 이유 양상과 영양상태에 관한 연구

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영유아 시기의 영양여하는 그 시기에 있어서 뿐만 아니라 일생을 통한 정신적 육체적 성장발육 및 질병에 대한 저항력, 이환율과 사망율, 그리고 국민 평균여명에 까지도 영향을 미치는 것으로서 그 중요성은 잘 알려져 있는 사실이다.

저자들은 우리나라에 있어서 이유기를 전후한 식품 섭취양상을 엿보기 위하여 전국을 도시, 읍, 평야, 산간 및 섬 지역으로 나누어 만 3세 미만의 어린이 304명을 대상으로 봄과 가을 2회에 걸쳐 조사를 실시하여 다음과 같은 결과를 얻었다.

1. 7개월까지는 모두가 모유를 먹고 있었으며 1예는 우유를 먹고 있었다. 8개월 이후 17개월까지는 약 10%에서, 18개월에서 23개월 사이에는 약 50%가 이유를 끝냈으며 30개월과 35개월 사이에서는 84%가 이유를 완료하고 있었다.

2. 모유를 18개월까지는 하루 4회이상, 그리고 그 후 30개월까지도 2회 이상씩 계속 먹이다가 그후 갑자기 그치고 있었다.

3. 적절한 유동식이나 보조식등의 이유식이 없이 일반 성인음식을 그대로 먹이고 있었으며 동물성 단백질이나 지방질 섭취는 적었고 식물성 단백질음식도 적은

국물 형태도 섭취하고 있었다.

4. 채소류와 멸치등은 쉽게 구할 수 있음에도 불구하고 충분히 보급받지 못하고 있었다.

5. 체중 및 신장의 신체계측에 의한 발육상태는 6개월 내지 12개월 경부터 뒤지기 시작하여 그후 계속발육지연을 보여주고 있었다.

6. 심한 단백 「칼로리」영양실조증 환자가 1예 있었으며 다른 1예는 영양소모증 환자였다.

7. 상완위 측정결과는 3개월 이하의 남아를 제외하고는 모두가 충분한 크기에 달하지는 못했다.

8. 영양결핍양상을 신장에서는 지수 1이 5.9%, 체중에서는 지수 1이 8.9%, 2가 1.3%, 4가 1.0%로서 체중 전체로는 11.2%였고, 상악위에 있어서는 지수 2, 3, 4가 도합 8.9%였다.

9. 1-3세의 유아 사망율은 12.3%였고 이유기 설사발병율이 19.7%였다.

이상의 결과로 우리나라 영유아들에 있어서 적절한 시기에 적절한 방법으로 이유를 실시하므로써 이 시기의 질병발생 및 사망율의 저하를 가져올 수 있고 나아가서는 신체발육양상을 호전시킬 수 있을 것이다.