[短報]A survey of iron deficiency anemia in low birth weight infants at late infancy in Nakagusuku Village

A survey of iron deficiency anemia in low birth weight infants at late infancy in Nakagusuku Village

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ABSTRACT

The prevalence of anemia and the serum ferritin levels were investigated in low birth weight infants at late infancy. The subjects were examined by different feeding methods. The results showed that the prevalence of anemia was higher in low birth weight infants group than those of control group. However, the levels of serum ferritin were low in both groups. The nutritional counseling might be important to prevent iron deficiency anemia at late infancy. *Ryukyu Med. J., 15(3)153~155 1995*

Key words: low birth weight infant, iron deficiency anemia, late infancy, serum ferritin, nutritional counseling

INTRODUCTION

The incidence of low birth weight infants has been slightly increasing for the past seven years in Japan[1]. However the rate of these infants in Okinawa prefecture is higher than that of the whole Japan[2]. The low birth weight infant has lower volume of total body iron relative to normal infants. Thus in late infancy, they are likely to have a higher risk factor for iron deficiency anemia (I.D.A) than normal babies. Iron deficiency anemia at late infancy affects psychomotor development[3], therefore it is extremely important to prevent iron deficiency anemia.

Hokama noted that the prevalence of iron deficiency anemia of normal infants in an Okinawan village at late infancy is 18.7 to 46.4%[4]. At late infancy even if healthy, full-term infants tend to be iron deficient. In the present study the hemoglobin levels of low birth weight infants at late infancy were investigated to evaluate the prevalence of iron deficiency anemia in the same village.

MATERIALS AND METHODS

In this study, babies with a birth weight less than 2500g were classified as low birth weight infants. Forty-eight low birth weight infants who received regular medical examination and routine screening test for anemia in Nakagusuku village were selected for the study. Fifty-eight infants with birth weights greater than 2500g were selected for the control group by using the random sampling method. All babies were born between 1989 and 1993.

Table 1 Mean gestational age, birth weight and introduced semi-solid food in low birth weight infants and normal weight infants

	Low birth weight infants n=48	Control infants n=58
Gestational age (weeks)	36.0 ± 3.1	39.1 ± 1.4
Birth weight (g)	2132±375	3137±331
Age introduced semi-solid food (months)	5.1±1.0	4.6±0.9

Values are mean ± s.d.

During their infancy, they received regular medical examinations and nutritional counseling was given to their mothers.

The characteristics of low birth weight and control infants are shown in Table1. The gestational age of low birth weight infants was shorter than that of control infants. Most low birth weight infants were preterm babies with mean birth weight of about 2132g. Premature infants with birth weights less than 1000g were not included in this study.

The mean age of introducing semi-solid food in low birth weight infants group and control group were 5.1 and 4.6 months respectively. Both the low birth weight infants and the control group infants were divided into three groups according to their feeding methods at late infancy as follows;

Breast-fed = exclusively breast fed infants

Table 2 Mean Kaup index and Hemoglobin concentration in low birth weight infants and normal weight infants

Feeding method	n	Kaup index	Hemoglobin (g/dl)
Low birth weight infants			
Breast-fed	8	17.1±1.3	11.4±1.3
Partially breast-fed	4	18.3±2.4	10.9±1.0
Formula-fed	36	16.6±1.4	12.2±1.0
Control infants			
Breast-fed	6	17.4±1.7	12.1±1.0
Partially breast-fed	7	17.5±1.2	11.8±0.7
Formula-fed	45	17.2±1.2	12.1±0.9

All values except n are expressed as mean ± s.d.

Partially breast-fed = partially breast fed infants
Formula-fed = exclusively or mainly formula fed infants

The hemoglobin levels in capillary blood were estimated by the cyanmethohemoglobin method. In this study, infants with a hemoglobin concentration less than 11.0g/dl were classified as having anemia. Serum ferritin was determined in duplicate by the enzyme immunoassay method.

RESULTS

Table2 shows the Kaup index and hemoglobin concentrations among the groups.

In the low birth weight infants group, mean values of Kaup index vary in three feeding methods. But the mean values in the control group are similar among each feeding groups. Thus the growth was within normal range in both groups.

In the low birth weight infants, mean hemoglobin concentration of partially breast-fed is the lowest level among three different feeding groups. However, in the control group mean hemoglobin concentration of partially beast-fed infants is slightly lower than the other two feeding groups, but all values are within normal range.

The prevalence of anemia at late infancy were shown in Table3. In the low birth weight infants, the prevalence of anemia is the highest in partially breast-fed infants. Those rates of control group are similar to breast-fed and partially breast-fed infants, and the prevalence in formula-fed infants shows the lowest rate of all the subjects.

Forty-two of the subjects were examined for serum ferritin as shown in Table4. Mean values of serum ferritin in the low birth weight infants and normal weight infants in exclusively breast fed infants were the lowest.

Table 3 The prevalence of anemia among different feeding methods

Feeding method	Low birth weight infants	Control infants
Breast-fed	2 (25.0)	1 (16.7)
Partially breast-fed	2 (50.0)	1 (14.3)
Formula-fed	5 (13.9)	3 (6.7)

Values indicate the number of anemic infants in each feeding group. Values in parentheses are percentages.

Table 4 Mean ferritin values among different feeding methods in low birth weight infants and normal weight infants ng/ml

Feeding method	n	Low birth weight infants	n	Control infants
Breast-fed	4	22.8 (11.9~43.5)	3	28.1(15.0~52.6)
Partially breast-fed	2	35.0 (31.5~38.8)	4	49.1(22.2~108.3)
Formula-fed	17	44.4 (28.7~68.5)	12	50.1(31.0~81.1)

Values are expressed as geometric means ± s.d. range.

DISCUSSION

Yip R et al stated that iron deficiency anemia is now mild and uncommon in middle-class setting children who received regular medical care and nutritional counseling in the United States[5]. On the other hand, it is reported that the prevalence of anemia was estimated to be 12% in developed regions of the world[6].

During the first few months of life when neonatal iron stores are still present, it is generally said that there is little risk of iron deficiency even without additional iron. However, at late infancy infants have exhausted their storage iron which they had at birth, therefore they are prone to develop iron deficiency state. It is said that volume of iron storage at birth is proportional to birth weight. For this reason low birth weight infants have a lower level of iron storage and higher risk factor for iron deficiency anemia than those of normal term infants.

In the present study, the hemoglobin concentration is within normal range in the low birth weight infants. However, levels of serum ferritin in the low birth weight infants were lower than those of the control group. Particularly levels of serum ferritin in breast-fed infants was lowest among all of the subjects. It is said that serum ferritin reflects iron storage, therefore low birth weight infants and

exclusively breast-fed infants have a little iron storage.

In 1989 Walter T. et al reported that anemic infants had significantly lower Mental and Psychomotor Development Index scores than control infants or non-anemic iron deficient infants[3].

Even if iron deficiency anemia was mild and asymptomatic, it affected psychomotor development. Therefore it is extremely important to prevent iron deficiency anemia or iron deficiency states which may lead infants to disadvantageous psychomotor development.

It is reported that use of iron fortified-formula or iron supplementation is effective to prevent iron deficiency anemia in low birth weight infants and in breast-fed infants[5,6]. However in Japan, it is thought that if weaning is carried out according to the recommendations on weaning from the research group of the Ministry of Health and Welfare, the infants will be expected to take adequate iron nutrition for successful growth and development. In the present study both low birth weight infants group and control group infants were introduced semi-solid foods at the age of 4-5 months. Therefore if semi-solid foods are given properly according to the recommendations on weaning from the research group of the Ministry of Health and Welfare, the infant is expected to maintain normal hemoglobin and serum ferritin concentrations.

Low birth weight infants received regular medical examinations and their mothers were provided with nutritional counseling in the present study. However at late infancy, the prevalence of the anemia in low birth weight infants is higher than control group. It is thought that nutritional counseling for mothers of these infants is particularly important. In order to prevent iron deficiency anemia at late infancy, nutritional counseling will be necessary to provide for the mothers many times over, not just a time.

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