SURVEY OF DIFFERENCES IN COST OF DIETS OF ANEMIC AND NONANEMIC CHILDREN

F. J. deCastro, M.D., M.P.H.
Frances L. Miller, M.P.H.

IRON deficiency in young children is a common nutritional deficiency in the United States. Although multiple causes may be responsible for iron deficiency anemia, poor diet seems to be a major factor. This study was undertaken to determine the difference in price between foods in the diets of nonanemic children and children with iron deficiency anemia.

Material and Methods

The sample studied consisted of 100 randomly selected, nonchronically ill children between the ages of 6 months and 3 years coming for pediatric care at the Wayne County General Hospital Acute Care Clinic in Eloise, Mich.

A questionnaire to fill out was given each adult accompanying the participating child. The following information was requested: (*a*) identifying data—name, sex, age, race, and parental birthplace and educational level; (*b*) place where groceries were bought (large or small store); and (*c*) 24-hour diet recall for the previous day. Hemoglobin level, hematocrit value, red blood cell count, reticulocyte count, mean corpuscular volume, mean corpuscular hemoglobin, and mean corpuscular hemoglobin concentration were obtained on each child.

Because food for our patient population was bought in large grocery stores by better than 90 percent of the families, we selected a 10 percent random sample of large stores serving our population to investigate food prices. Prices were obtained for all items listed in the diet of the children in our sample. The price of food per day per child was calculated from the items listed in the diet recall for the previous 24 hours.

The children were divided into anemic and nonanemic groups. Criterion for iron deficiency anemia was set at a hemoglobin level of 10 gm. per 100 cc. of blood. In order to rule out sickle cell anemia, those patients classified as anemic were further studied if their reticulocyte count was more than 2 percent. Those patients having an identified chronic illness or discovered to have sickle cell disease or trait, or those receiving medicinal iron were eliminated.

Results

Twenty-two percent of the 100 children had iron deficiency anemia. Blood values for anemic and nonanemic children are shown in the table. The mean hemoglobin concentration for the anemic group was 7.9 gm. per 100 cc. of blood and for the nonanemic group, 10.9. Milk intake, in percent of total daily calorie intake, was similar in both groups ($P<0.05$). The mean cost of food per day for the diet for the 100 children was \$0.57; for the anemic children the cost was \$0.63±\$0.31 (±S.D.), and for the nonanemic group, it was \$0.55±\$0.23 (±S.D.). The difference is not significant ($P<0.05$). The distribution of the cost of food for the anemic and nonanemic children is shown in the chart.

Statistical analysis of the identifying data showed no significant difference between anemic

Dr. deCastro is an assistant professor, department of pediatrics and community medicine, Saint Louis University, and director, outpatient department, Cardinal Glennon Memorial Hospital for Children, St. Louis. Mrs. Miller is a nutritionist, Children and Youth Project, Wayne County General Hospital, Eloise, Mich.

and nonanemic children in age, sex, race, and parental educational level. The only significant difference between the two groups was that parents of the anemic children were more frequently southern born ($P<0.05$).

Discussion

During infancy, because of the rapid rate of growth, iron requirements in proportion to food intake exceed those of any other period of life (*1*). The incidence of iron deficiency anemia in young children in the United States ranges from 20 to 40 percent (*1–3*). Although etiologic factors are numerous (*4, 5*), poor nutrition seems to be a significant factor.

To use fully today's scientific and technological advances in infant feeding, many mothers need guidance in meeting the dietary needs of the baby in ways that are compatible with general home conditions (*6*). Even though studies regarding the requirements of iron during childhood are numerous (*7, 8*), few investigations regarding the price of food in the diets of anemic and nonanemic children have been made.

Previous studies have related iron deficiency anemia to biological factors, such as low birth weight (*1,6*), and to sociological factors, such as ethnic background or excessive milk intake (*4*). Biological factors in the etiology of childhood iron deficiency anemia were not investigated in this study.

Our study was intended primarily to determine the significance of the cost of food in the diet of young children who had iron deficiency anemia. Diet records were obtained by 24-hour recall (*9*). Children whose hemoglobin level was below 10 gm. per 100 cc. of blood were diagnosed as anemic as defined by Nist and coworkers (*4*).

Some sociological factors in the etiology were also investigated. The only factor observed to be of significance in the 100 children we studied was parental birthplace. The probability of anemia was higher among children of southern-born parents ($P<0.05$).

The southern population in our community has usually come from rural southern areas to work in factories around the county hospital. It is probable that limited cultural exposure may be the common denominator between this geographic background and other geographic and ethnic backgrounds correlated in previous studies (*4*).

Mean blood values for 100 anemic and nonanemic children

Determination	Total sample (N=100)	Anemic (N=22)	Nonanemic (N=78)
Hemoglobin value (gm. per 100 cc.)	10. 3	7. 9	10. 9
Hematocrit value (percent)	33. 7	29	35
Reticulocyte count (percent)	1. 4	1. 6	1. 1
Mean corpuscular volume (cu. μ)	75	66	78
Mean corpuscular hemoglobin (μ mcg.)	22. 4	19	25
Mean corpuscular hemoglobin concentration (percent)	31	28	32

The important discovery of this study was the lack of a statistically significant difference between the cost of the food in the diets of anemic and nonanemic children.

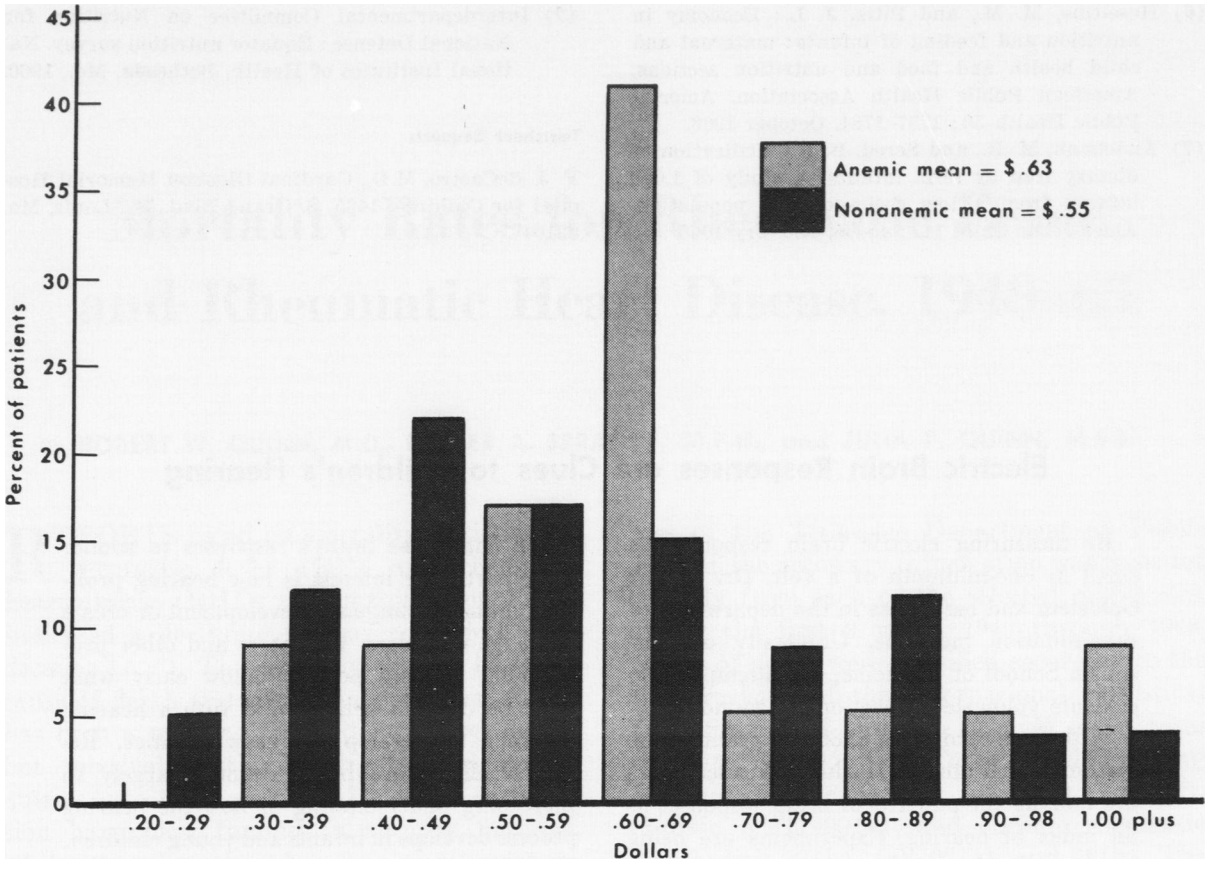
The results of this study suggest that, in this population, iron deficiency anemia of young children is not caused directly by an insufficient amount of money being spent on their food. Results also suggest that cultural deprivation may be associated with iron deficiency anemia. Health education in food budgeting and iron content of food as well as work toward the elimination of other sociologic factors associated with poverty and iron deficiency anemia, such as low birth weight, should be stressed to eliminate iron deficiency anemia in young children.

Summary

This study was undertaken to compare the cost of food given young children having iron deficiency anemia with that given nonanemic children. A sample of 100 children, 6 months to 3 years, was randomly selected from children coming for pediatric care at the Wayne County General Hospital Acute Care Clinic in Eloise, Mich. This clinic serves a low socioeconomic population.

Identifying data, parental birthplace and

Cost of food in daily diet of anemic and nonanemic patients



educational level, previous 24-hour diet recall, hemoglobin level, hematocrit value, red blood cell indices, and reticulocyte count were recorded for each child. Children having sickle cell disease or trait, identified chronic illness, or who were receiving medicinal iron were eliminated. Criterion for iron deficiency anemia was set at a hemoglobin value of less than 10 gm. per 100 cc. of blood. Food was priced in a restricted randomized sample of grocery stores serving this population, and the cost per child per day was calculated.

The incidence of iron deficiency anemia was 22 percent. The mean hemoglobin level of the anemic group was 7.9 gm. per 100 cc. of blood and that of the nonanemic, 10.9. Statistical analysis of the variables studied suggested that iron deficient anemic children were more frequently children of parents who were born in the south.

Differences in the cost of food in the diet of the anemic and nonanemic children were not statistically significant. These results suggested that, in the population studied, iron deficiency anemia of young children was not directly caused by parents spending an insufficient amount of money on food.

REFERENCES

(*1*) Council of Food and Nutrition: Iron deficiency in the United States. JAMA 203: 406–412, Feb. 5, 1968.

(*2*) Smith, C. A.: Overuse of milk in the diet of infants and children. JAMA 172: 567–569, Feb. 6, 1960.

(*3*) Beal, V. A., Meyers, A. J., and McCammon, R. W.: Iron intake, hemoglobin, and physical growth during the first two years of life. Pediatrics 30: 518–539, October 1962.

(*4*) Nist, R. T., Bhardway, B., and Langkowsky, P.: Prevalence and pathogenic factors of anemia in children in New York City. *In* Proceedings of the Ambulatory Pediatric Association, New York, 1968, p. 1.

(5) Woodruff, C. W.: Multiple causes of iron deficiency in infants. JAMA 167: 715–720, June 7, 1958.
(6) Heseltine, M. M., and Pitts, J. L.: Economy in nutrition and feeding of infants: maternal and child health and food and nutrition sections, American Public Health Association. Amer J Public Health 56: 1757–1784, October 1966.
(7) Andelman, M. B., and Sered, B. R.: Utilization of dietary iron by term infants: a study of 1,048 infants from a low socioeconomic population. Amer J Dis Child 111: 45–55, January 1966.
(8) Schulman, I.: Iron requirements in infancy. JAMA 175: 118–123, Jan. 14, 1961.
(9) Interdepartmental Committee on Nutrition for National Defense: Equator nutrition survey. National Institutes of Health, Bethesda, Md., 1960.

Tearsheet Requests

F. J. deCastro, M.D., Cardinal Glennon Memorial Hospital for Children, 1465. S. Grand Blvd., St. Louis, Mo. 63104

Electric Brain Responses are Clues to Children's Hearing

By measuring electric brain responses as small as one-millionth of a volt, Dr. Robert Goldstein and associates in the department of rehabilitation medicine, University of Wisconsin School of Medicine, are attempting to evaluate youngsters' reactions to sound.

With the award of an $180,000 grant by the National Institutes of Health, the researchers are looking for patterns of brain responses as an index of hearing. Experiments are being conducted with procedures designed to determine a person's ability to perceive sound, not just his ability to hear. The first time a person hears a sound, the brain wave patterns usually register much more reaction than the second and third times. This is the body's way of protecting itself from overreacting to each sound. Yet, there are definite electrical changes in the brain.

The researchers use an average response computer to chart these separate reactions to a sound on top of each other, to find the constant response to a sound that is always buried in the brain's greater electrical activity. With this procedure, they hope to get some idea of how the child's brain is handling the sound pattern.

A child's brain responses are measured in a special soundproof room using electrodes attached to his head. The level of sound presented is regulated from a control room. The brain waves are fed into an EEG machine and then into the average response computer, which charts the brain's responses to sound.

Of particular interest is how hearing problems influence language development or create language disorders. Educators and other professional workers need to know early what must be done to help a child with a hearing disorder to develop language abilities. Research efforts are being devoted largely to increasing understanding of how the hearing process develops in infants and young children. The researchers are also seeking to measure the hearing of children who are too young, unwilling, or otherwise unable to respond to present tests which measure overt behavior in response to sound.

Besides measuring hearing ability, the clinicians at the Center for Communicative Disorders of the department of rehabilitation medicine are attempting to measure a person's overall ability to find out if a child is suffering from deafness or whether general retardation or mental disturbance complicates matters. Results from children with normal responses to sound will be used to evaluate hearing-handicapped children.

By researching how the brain reacts, the physicians hope to find whether a child will encounter difficulties other than impaired hearing. They are especially interested in finding out how the initial response to sound (the response within the first one-twentieth second after the sound is presented) varies with age and general development.