Risk Factors for the Prevalence of Malnutrition among Urban Children in Ghana

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Summary A case-control study was completed at the Princess Marie Louise Hospital in Accra, Ghana, to identify risk factors for the prevalence of underweight and severe malnutrition in urban African children. A total of 170 children, aged 8 to 36 mo, with normally nutritional status (≥80% W/A of NCHS reference), underweight (moderate malnutrition) (60–80% W/A), or severe malnutrition (<80% W/A and presence of edema, or <60% of W/A) were recruited at the clinical ward and at the public health service section of the hospital. Anthropometric measurements and physical examinations were completed, and the guardians were interviewed about their children’s health status, birth weight, child care, and household conditions. The severely malnourished children were more likely to have young mothers (p<0.05) and low weight at birth (p<0.05). The underweight children were also observed to have low birth weight (p<0.05). The severely malnourished group showed the tendencies of less feeding frequency (p<0.01), less access to breast-feeding (p<0.01), and less support by both parents (p<0.05). Moreover, the parents of the severely malnourished children had lower educational levels and lower-income jobs, compared with those of the normal children (mother’s education, p<0.001; father’s education, p<0.001; mother’s occupation, p<0.05; father’s occupation, p<0.001). No significant differences in most variables existed between the normal and underweight groups. Multivariable analysis resulted in the conclusion that the Z-score of weight-for-age, birth weight, and mother’s educational level were highly associated with one another. We conclude that low birth weight is one of the important risk factors for the prevalence of underweight and severe

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malnutrition and that the lack of a mother’s education is also a risk factor for the prevalence of severe malnutrition in the urban children in Ghana.

**Key Words** malnutrition, underweight, low birth weight, mother’s education, Ghana

The etiology of malnutrition involves many underlying factors such as social, economic, cultural, and environmental conditions and the proximate biological determinants of individual health and infection. The underlying factors that affect household conditions directly and indirectly include parental education, employment, and child care and support. Many studies have examined the effects of these socioeconomic variables on the nutritional status of infants in developing countries and have contributed to clarifying the etiology of malnutrition (1–4). Through these studies, many factors have been recognized to be associated with children’s nutritional status. However, it is still uncertain which factor is most significantly affecting the occurrence of malnutrition or growth faltering, since the relationships between these factors and malnutrition vary among different societies. Therefore it is important to explore these relationships in societies with common social and cultural backgrounds.

In the region of West Africa, several studies have been undertaken to examine the relationship between household background and infant nutritional status (5–8). In terms of risk factors for malnutrition, a conclusion has not been reached. In general, it is believed that low birth weight is associated with subsequent growth failure in developing countries. However, babies with low birth weight do tend to catch up, so that although low weight-for-age babies are common in the developing countries, this does not seem to be an adequate explanation of postnatal growth failure (9). Low birth weight may be associated with the prevalence of malnutrition in West Africa, but this relationship has not been studied sufficiently. And, besides low birth weight, many factors may be involved in causing moderate or severe malnutrition, so it is quite difficult to examine all the factors. Therefore we focused on birth weight, household background, demographic variables, underlying parental characteristics, and child-care practice to examine which factors are important for the occurrence of malnutrition.

Since most previous studies compared household variables between normal and severely malnourished groups, this study compared those of three nutritional status groups (normal, underweight, and severely malnourished). This is because being underweight is an even more common condition than severe malnutrition is. Furthermore, this study was undertaken targeting children in urban areas because few studies have been undertaken concerning the risk factors for malnutrition in urban children.
METHODS

Subjects. Data were collected from April to October 1994 at the Princess Marie Louise (PML) Hospital in central Accra, Ghana. The target population consisted of children, aged 8 to 36 mo, who were admitted with various degrees of protein-energy malnutrition, and those with normally nutritional status or with underweight attending the public health service section of the same hospital. Data collection was done twice a week. Every Monday about 5 subjects were selected randomly from the normal or underweight groups that had been screened by the growth monitoring in the well-baby clinic, and every Thursday another 5 subjects or fewer were selected randomly from the clinical ward. In regard to clinically malnourished children, selection was made only from those admitted to the hospital within the previous 7 d and who lived in urban communities in Accra. The consent of the child’s mother or guardian was sought to allow the child to participate in this study. When the mothers consented, they were interviewed and anthropometric measurements were then taken from the children.

A total of 177 subjects were recruited during the study period, and 3 study groups—61 normal children, 49 underweight children, and 60 severely malnourished children—were formed; data for 7 children were removed from the analysis, since they could not be classified into the three groups because of their normal weight and edema. The severely malnourished children were diagnosed by using the Wellcome classification as having either kwashiorkor, marasmus, or marasmic kwashiorkor (10). The normal group consisted of children with W/A (weight-for-age) 80% of the NCHS reference data; the underweight group with W/A 60–80%; and the severely malnourished group with W/A <80% and presence of edema (kwashiorkor), with W/H<60% (marasmus), or with W/A<60% and presence of edema (marasmic kwashiorkor). The children's mean age, weight, height, and the Z-scores of weight-for-age, height-for-age, and weight-for-height are shown in Table 1 by study groups. The Z-score determines the distance of a measurement such as weight or height from the mean of the reference distribution of weights or heights in the reference population for the given age and sex.

Interview survey. Questionnaires were administered to obtain information on the subjects’ socioeconomic backgrounds, such as age, sex, mother’s age, number of siblings, birth order, birth weight, child care indicators (caretaker, breast-feeding, and feeding frequency), provider, parental education, and parental occupations. The interview was done by trained personnel of the Noguchi Memorial Institute for Medical Research, who can proficiently communicate in the several major local languages.

A mother’s age was expressed as the age at the birth of her child. The number of siblings was expressed as a number that included the target subject. The birth weight was recorded from the child’s growth monitoring card. When no record of birth weight was available, it was treated as missing data. Low birth weight was defined as less than 2,500 g; both preterm babies and underweight full-term babies
were included in this group.

The caretaker was defined as a person who had the primary responsibility for child care, such as feeding, health care, and other security care. The provider for upkeep of the child was defined as a person who regularly provided living expenses for his/her family, including the child. The presence of breast-feeding was confirmed by question, irrespective of its frequency or the presence of complementary food. Daily feeding times were also elicited as the usual frequency during the past several weeks. Feeding snacks were counted in the frequency, but not the consumption of beverages.

Educational level was classified into 4 different grades: no school, primary school, middle school, and secondary high school and above. The parental educational level was determined according to kind of school in which the child's parents had studied for more than one year. In Ghana, people typically attend an elementary school for 6 to 10 y, a middle school for 3, a secondary high school for 3 to 5, a polytechnic school or college for 2 to 4, and a university for 4 to 5 y. Since there is a large difference in academic levels between urban and rural schools, the category of school was adopted as an indicator for estimating educational level, instead of the period of attending school.

Occupational status was classified into 4 different grades based on kind of job: no job, an unstable-income job, a relatively stable-income job, and stable-income job. No job was defined as a situation in which a person was not engaged in any job accompanied by a certain wage, whether intensively or not. An unstable-income job was defined as a situation in which a person having no skills could work in his or her own business, such as a petty trader (as it is commonly called in Ghana) or in a small-scale roadside business. A relatively stable-income job was defined as one in which a person worked by using skills and which provided the minimum wage necessary for life support, but providing no guarantee of permanent employment, such as carpenter, artisan, or engineer. A stable-income job was defined as one that provided permanent employment with a constant wage, such as company employee, civil servant, businessman, or professional. This categorization was made in consideration of the social situation in Ghana.

Statistics. SPSS and PC-SAS were used to analyze the data. The mean values of anthropometric measurements and demographic parameters were compared among the groups of normal, underweight, and severely malnourished children by using analysis of variance from age and analysis of covariance with age as the covariates for the other variables. When no correlation between age and the response variable was available, these values were tested for significance at \( \alpha = 0.05 \) with Tukey's test. Since sample sizes were not equal in all the groups, separate harmonic means were computed for each pair of groups being compared (SPSS version 6.1). When a correlation was found between age and other variables, these variables were compared by using the least square means option of the program in PC-SAS. A \( p \)-value of 0.05 or less was considered statistically significant. The percentage of each answer in terms of parental issues (provider of upkeep, parental occupation,
and education) and child care issues (caretaker and breast-feeding) were compared among the three groups by using Pearson’s Chi-square test for independence. To clarify the relationship between the prevalence of malnutrition and birth weight, demographic parameters, and child-care parameters, factor analysis (with varimax rotation) was performed on the outcome variables, and the resulting factors were also examined with analysis of covariance.

RESULTS

1. Anthropometric measurements

Z-scores of weight-for-age, height-for-age, and weight-for-height are shown in Table 1. The data of Z-scores demonstrate that the severely malnourished children had great growth retardation.

Their birth weights, which were cited from the growth monitoring record, were compared among the normal, underweight, and severely malnourished children (Fig. 1). The average birth weights of the normal, underweight, and severely malnourished children are $3.21 \pm 0.45$ kg, $2.92 \pm 0.50$ kg, and $2.64 \pm 0.70$ kg, respectively. The underweight and severely malnourished children had significantly lower birth weights than the normal children did ($p < 0.05$). The average birth weight

| Groups             | Normal          | Underweight     | Malnutrition |
|--------------------|-----------------|-----------------|--------------|
| Sample size        | 61              | 49              | 60           |
| Sex (m/f)          | 32/29           | 29/20           | 28/32        |
| Anthropometric measurements |              |                 |              |
| Body weight (kg)   | $9.5 \pm 1.5^a$ | $7.4 \pm 0.9^b$ | $6.4 \pm 1.7^c$ |
| Height (cm)        | $76.7 \pm 5.6^a$ | $72.7 \pm 4.1^b$ | $70.9 \pm 7.0^c$ |
| Z-score            |                 |                 |              |
| Weight/age         | $-0.73 \pm 0.89^a$ | $-2.71 \pm 0.51^b$ | $-3.96 \pm 1.01^c$ |
| Weight/height      | $-0.61 \pm 0.90^a$ | $-2.17 \pm 0.72^b$ | $-2.69 \pm 1.10^c$ |
| Height/age         | $-0.32 \pm 1.02^a$ | $-1.66 \pm 0.83^b$ | $-3.07 \pm 1.27^c$ |
| Demographic data   |                 |                 |              |
| Age (mo)           | $14.8 \pm 5.5^a$ | $14.1 \pm 4.0^a$ | $17.6 \pm 6.2^b$ |
| Mother’s age (y)   | $25.8 \pm 5.9^ab$ | $26.8 \pm 6.6^a$ | $23.3 \pm 6.1^b$ |
| No. of siblings    | $2.03 \pm 1.18^a$ | $2.65 \pm 1.45^b$ | $2.23 \pm 1.27^ab$ |
| No. of household members | $5.52 \pm 2.30^a$ | $5.22 \pm 1.75^a$ | $5.65 \pm 2.40^a$ |

1 Values are mean $\pm$ SD. Values in the same row not sharing a common superscript alphabet are significantly different ($p < 0.05$).
2 Severe malnutrition.
3 The age at the birth of her child.
4 Excluding dead siblings.

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in the severely malnourished children also tended to be lower than in the underweight
children, but this was not statistically significant. The percentage of children with
low birth weights (less than 2,500 g) was significantly higher in the severely
malnourished group than in the normal group (normal (N) vs. severe malnutrition
(M), \(X^2=13.9, \text{df}=2, p<0.001\)): 6% in the normal, 15% in the underweight, and
31% in the severely malnourished.

2. Demographic characteristics

The mother's mean age at the births of the babies was lower in the severely
malnourished group than in the normal and underweight groups (Table 1). The
proportion of mothers who were teenagers at the time of birth tended to be higher
in the severely malnourished than in the other groups: 20% in the normal group,
17% in the underweight group, and 35% in the severely malnourished group.

The number of siblings was not larger than expected. The average, including
the subject, was 2.0 in the normal group, 2.7 in the underweight, and 2.2 in the
severely malnourished (Table 1). The mean number of siblings was signifi-
cantly higher in the underweight group than in the normal group (\(p<0.05\)), but
that of the severely malnourished group did not significantly differ from the
others.

The number of individuals residing in the selected households did not differ
among the three groups, with an average household size of 5 to 6 (Table 1). There
was no significant difference in the rate of birth order among the groups
(Table 2).

3. Child care and feeding practices

A smaller percentage of severely malnourished children was cared for primarily
by their mothers: 93% of the normal children and 96% of the underweight children
Table 2. Percentage of children in normal, underweight, and severely malnourished groups that showed each category of child-care indicators and parental educational levels and occupational statuses.

| Groups                  | Normal (n=61) | Underweight (n=49) | Malnutrition<sup>1</sup> (n=60) | $X^2$ test<sup>2</sup> | $p$ |
|-------------------------|---------------|--------------------|----------------------------------|------------------------|-----|
| Caretaker               |               |                    |                                  |                        |     |
| mother                  | 93.4          | 95.8               | 79.7                             | All groups *           |     |
| grandmother             | 3.3           | 0.0                | 15.3                             | N vs. U NS            |     |
| others                  | 3.3           | 4.2                | 5.1                              | U vs. M *             |     |
| Feeding frequency       |               |                    |                                  |                        |     |
| <3 times                | 15.0          | 22.4               | 20.7                             | All groups * NS       |     |
| 4 times                 | 30.0          | 40.8               | 51.7                             | N vs. M **            |     |
| >5 times                | 55.0          | 36.7               | 27.6                             | U vs. M NS            |     |
| Currently breast-feeding|               |                    |                                  | All groups *** NS     |     |
|                         | 54.1          | 65.3               | 28.8                             | N vs. U NS            |     |
|                         |               |                    |                                  | N vs. M **            |     |
|                         |               |                    |                                  | U vs. M ***           |     |
| Birth order             |               |                    |                                  |                        |     |
| 1st                     | 39.3          | 26.5               | 43.3                             | All groups NS         |     |
| 2nd                     | 29.5          | 24.5               | 21.7                             | N vs. U NS            |     |
| 3rd                     | 13.1          | 20.4               | 15.0                             | N vs. M NS            |     |
| 4th or later            | 18.0          | 28.6               | 20.0                             | U vs. M NS            |     |
| Provider                |               |                    |                                  |                        |     |
| both parents            | 78.7          | 70.8               | 51.7                             | All groups * NS       |     |
| mother                  | 11.5          | 18.8               | 18.3                             | N vs. U NS            |     |
| father                  | 6.6           | 4.2                | 18.3                             | N vs. M *             |     |
| other                   | 3.3           | 6.3                | 11.7                             | U vs. M NS            |     |
| Mother's education<sup>3</sup> | | | | | |
| I                       | 8.2           | 22.4               | 40.0                             | All groups *** NS     |     |
| II                      | 8.2           | 16.3               | 28.3                             | N vs. U NS            |     |
| III                     | 60.7          | 44.9               | 30.0                             | N vs. M ***           |     |
| IV                      | 23.0          | 16.3               | 1.7                              | U vs. M **            |     |
| Father's education<sup>3</sup> | | | | | |
| I                       | 0.0           | 6.7                | 23.5                             | All groups *** NS     |     |
| II                      | 5.1           | 4.4                | 11.8                             | N vs. U NS            |     |
| III                     | 47.5          | 60.0               | 52.9                             | N vs. M ***           |     |
| IV                      | 47.5          | 28.9               | 11.8                             | U vs. M *             |     |
were being cared for by their mothers, whereas about 80% of the severely malnourished children were being cared for by their mothers (Table 2). However, only a marginally significant difference was found between the values of the normal and the severely malnourished groups. Fifteen percent of the severely malnourished children were being cared for by their grandmothers. No case of care by the father and very few cases of care by relatives were found among all groups.

The proportion of children fed less than 4 times per day was 45% in the normal, 63% in the underweight, and 72% in the severely malnourished groups (N vs. M, $X^2=9.3$, df=2, $p<0.01$) (Table 2). The severely malnourished group tended to take fewer meals per d than the other groups did.

The percentage of children who were breast-fed was lowest in the severely malnourished and highest in the underweight groups (all groups, $X^2=15.5$, df=2, $p<0.001$) (Table 2). Since age affects when breast-feeding is stopped, it is reasonable to compare the percentages of breast-fed children among the three groups at the same age. In the age group of 8 to 11 mo, the percentage of breast-fed children was 83% in the normal group, 93% in the underweight, and 60% in the severely malnourished (Fig. 2). However, this difference was not statistically significant. In the 12- to 17-mo-old children, the percentages were about 73% in the normal and underweight groups and 33% in the severely malnourished group (all groups, $X^2=7.4$, df=2, $p<0.05$). The children aged ≥18 mo were rarely breast-feeding,
4. Parental characteristics

About 80% of the normal children were supported by both parents, whereas only about 50% of the severely malnourished children were (Table 2). Seventy percent of the underweight children were supported by both parents. The percentage of children who had both parents providing upkeep for them was significantly lower and no child >2 y was still breast-feeding. This result shows that severely malnourished children aged <18 mo were less likely to be currently breast-feeding than the normal and underweight children were.

Fig. 2. The percentages of children who were breast-fed at different ages in the normal, underweight, and severely malnourished groups.

Fig. 3. The percentages of mothers who have no education in school, or education in primary school, middle school, or secondary school and above in the normal, underweight, and severely malnourished groups.
in the severely malnourished group than in the normal group (N vs. M, $X^2=10.6$, df = 3, $p < 0.05$), and it was marginally lower than in the underweight group (underweight (U) vs. M, $X^2=12.9$, df = 3, $p = 0.075$).

Large differences were found in parents’ educational levels among the three groups (Table 2). A high proportion of severely malnourished children had parents who had not attended school beyond the primary grades. The percentage of children with uneducated mothers was only 8% in the normal group, but 22% in the underweight and 40% in the severely malnourished groups (all groups, $X^2=36.9$, df = 6, $p < 0.001$) (Fig. 3). The father’s educational level was higher than the mother’s in all groups and showed a tendency similar to the mother’s educational level in terms of differentiation among the groups (all groups, $X^2=30.9$, df = 6, $p < 0.001$).

The severely malnourished group showed a significantly lower percentage of children who had a father with a stable income job and a higher percentage of one with no job than the normal group did (N vs. M, $X^2=20.0$, df = 3, $p < 0.001$) (Table 2). The distribution of different jobs in the underweight group was significantly

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Table 3. Relationships between Z-scores, birth weight, and indicators of child care and demographic and parental characteristics (rotated factor matrix).\(^1\)

| Variables                          | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|------------------------------------|----------|----------|----------|----------|----------|
| Anthropometric measurements        |          |          |          |          |          |
| Weight/age Z-score                 | 0.94     |          |          |          |          |
| Weight/height Z-score              | 0.78     |          |          |          |          |
| Height/age Z-score                 | 0.80     |          |          |          |          |
| Birth weight                       | 0.71     |          |          |          |          |
| Demographic characteristics        |          | 0.76     |          | -0.76    |          |
| Mother’s age                       |          |          |          |          |          |
| No. of siblings                    |          | 0.94     |          |          |          |
| No. of household members           |          |          |          |          |          |
| Birth order                        |          |          | 0.95     |          |          |
| Child-care indicator               |          |          |          | 0.73     |          |
| Care by mother\(^2\)               |          |          |          |          | 0.73     |
| Feeding frequency                  |          |          |          | 0.63     |          |
| Parental characteristics           |          |          |          |          |          |
| Provision by both parents\(^3\)    | 0.45     | 0.43     | 0.39     |          |          |
| Father’s educational level         |          |          | -0.79    |          |          |
| Father’s occupational level        |          |          | 0.67     |          |          |
| Mother’s educational level         | 0.43     | 0.53     |          |          |          |
| Mother’s occupational level        |          |          |          |          | 0.70     |

\(^1\) Figures are correlation coefficients of the variables with common factors obtained in a factor analysis. When the values are more than 0.30, they are shown in the table.

\(^2\) “Care by mother” is a dichotomous variable (1, mother; 0, other person).

\(^3\) “Provision by both parents” is a dichotomous variable (1, both parents provide for child; 0, single parent or other).
5. Relations among variables

Factor analysis was performed to examine the relationships among the variables and to gain statistical power by combining variables (Table 3). Five common factors were obtained through this analysis. The results show that birth weight and mother’s educational level shared a common factor, Factor 1, with the Z-scores of weight-for-age, height-for-age, and weight-for-height as indicators for evaluating malnutrition. Factor 2 seems to primarily reflect mother’s age. Feeding frequency shared a common factor, Factor 3, with the mother’s educational and occupational status. Factor 4 was associated with the father’s educational level and occupational status. However, the father’s educational level is likely to be negatively correlated with his occupational status. This probably reflects a social situation in Ghana in which graduates of high school or above are facing problems of unemployment. Furthermore, the number of household members is negatively correlated with the presence of care by the mother and provision by both parents (Factor 5). Of these factors, 1 and 2 were significantly different between the three groups (N vs. U, N vs. M, and U vs. M; p < 0.05).

A significant correlation was found between birth weight and weight-for-age Z-score ($r = 0.50, p < 0.001$) (Fig. 4). Birth weight is also correlated with the mother’s educational level ($r = 0.24, p < 0.01$).
DISCUSSION

To identify risk factors for malnutrition, this study examined the relationships between the presence of malnutrition and various individual or socioeconomic conditions, in particular birth weight, child care, and demographic and parental characteristics in urban children in Ghana. It was found that many parameters showed significant differences between the normal and severely malnourished children, but that few parameters did between the normal and the underweight children. Of these variables, birth weight and the mother’s educational level are likely to be the most effective predictors of the presence of malnutrition. Other indicators, such as birth order and household size, were not associated with childhood undernutrition in this setting.

1. Low birth weight

The present results indicate that low birth weight can be a very important risk factor for the prevalence of underweight and malnutrition. It is notorious for contributing to the increased mortality of newborn babies in developing countries (11–13), but still the relationship between low birth weight and the prevalence of malnutrition has not been sufficiently defined. Several studies have been conducted to examine the relationship between birth weight and the children’s subsequent growth. Hitchcock and Coy (14) observed in their study on Australian infants that when gestational age was considered, the growth of appropriate-for-gestational age infants was similar to that of full-term infants of normal birth weight; small-for-gestational age infants displayed accelerated growth (catch-up), especially in the first months of life, with upward percentile crossing from below the 5th toward the 50th. Furthermore, Downes et al (13) have reported that although infants with low birth weight were at risk of increased mortality, their growth velocities were almost identical, and the significant differences in weight at 1 y reflected them at birth. On the other hand, Alvear et al (15) found significant differences in birth weight between normal and severely malnourished children in Chile. Victora et al (16) have reported that the study on Brazilian infants revealed a strong association between birth weight and attained weight and length and that virtually no malnutrition existed among children who weighed more than 3,000 g at birth; children with lower birth weights tended to put on less weight during the first year, but these differences were no longer significant after controlling for family income. These findings suggest that whether low birthweight can be a risk factor for malnutrition depends on the socioeconomic condition of the children. Our result demonstrates that a higher percentage of severely malnourished children had lower-educated mothers and low weight at birth and that low birth weight was significantly correlated with the mother’s educational level. These results indicate that low-birth-weight babies are at amplified risk of malnutrition under the condition of receiving child care from mothers with low education.
2. **Demographic characteristics**

Although there are several reports that family size, number of siblings, and birth order can be associated with poor child growth or prevalence of malnutrition (2, 17, 18), we could not confirm this finding in our study, except that underweight children tended to have a larger number of siblings. Large household size is widely regarded to be a risk factor for malnutrition in developing countries (5). It has been observed that children from large households consume diets of poorer quality and consequently are significantly shorter (19). Reichenheim and Harpham (17) have reported that growth failure occurred when the number of siblings was 3 or more. Moreover, Vella et al (2) and Upadhyay et al (18) found that the child’s birth order contributed significantly to the development of the child during infancy. However, other reports indicate that household size and number of siblings do not influence the prevalence of malnutrition (20, 21). Our results indicated that family characteristics such as household size, number of siblings, and birth order were not significant factors contributing to severe malnutrition, but that the number of siblings may be a factor for underweight. This inconsistency between severe malnutrition and underweight may be due to the difference between the mothers’ ages in both groups: that is, the age of the mothers of severely malnourished children is lower than that of underweight children.

A mother’s age may also be associated with the nutritional status of her children. Onadeko et al (22) have reported that teenage pregnancy can be a factor in low birth weight. Since younger mothers tended to have low levels of education and occupational status, (the occupational status of the spouses was also low), these conditions may contribute to their being less financially secure and having poorer child-care practices. Teenage pregnancy is now one of the important social problems in many developing countries because of the young mothers’ unstable socioeconomic status and their being too psychologically immature to care for their babies. Our result is that the severely malnourished children tended to have younger mothers or a higher percentage of teenage mothers, supporting the idea that early pregnancy can be a factor in children’s growth failure in developing societies.

3. **Child care**

Several factors related to child care must influence the occurrence of malnutrition. However, it is difficult to assess these factors because few appropriate indicators can be used to express the behavioral pattern of a mother’s child care quantitatively. Therefore, in this study only variables that could be obtained easily through questionnaires were adopted to examine their relationships with the extent and severity of malnutrition in urban Ghana. The results of this study indicate that children’s upkeep by both parents, frequency of feeding, and access to breast-feeding influence the nutritional status of children.

This study found that severely malnourished children were supported less often by both parents, compared with normal children, thus indicating that severely malnourished children are more likely to have poor socioeconomic backgrounds.
The underweight children showed a tendency similar to that of the severely malnourished.

Guldan et al (23) reported that caretakers in families with higher levels of education were found to feed the children more frequently. This finding supports the idea that frequency of feeding can also be an indicator of child care or feeding practice. The present study found that children with malnutrition were fed less frequently. It can be difficult to conclude, however, that feeding frequency alone is a key factor influencing nutritional status, since both quality and quantity of feeds are major determinants of nutritional status rather than feeding frequency alone. It is possible to speculate, though, that children who are fed less often tend to have poorer quality and quantity of food intake, assuming that feeding frequency can be an indicator of the quality of feeding practice. This possibility is probably supported by the results in which feeding frequency tended to be less often found with low parental educational level and poor parental job status.

The percentage of children who were breast-feeding was lowest in the severely malnourished group at ages of 8 to 17 mo. This observation supports the previous finding that early weaning is associated with a higher risk of malnutrition among children in developing countries (4, 24–26). In developing countries including Ghana, many children have inadequate intake of complementary foods, both quantitatively and qualitatively. Therefore they must depend on breast milk even after their first year to obtain nutritional requirements. Although there is a current controversy as to whether prolonged breast-feeding is associated with malnutrition (27, 28), the outcome of this study appears to support the idea that continual breast-feeding may be necessary for children who have insufficient complementary food intake. Concerning reasons why the severely malnourished group showed a lower percentage of breast-feeding at age 8 to 17 months in this study, the following three issues are considered to play significant determining roles: insufficient breast-milk production by impoverished mothers, neglect of the importance of breast-feeding, and inability to breast-feed for socioeconomic reasons reflected by the high rate of caretaker other than the mother. The first issue was not examined in this study, but the role of the last two issues might be supported by the results that the severely malnourished group had a tendency toward a low percentage of mother as caretaker and a lower educational level of their mother.

4. Parental characteristics

Several reports have demonstrated that parental occupation and educational level are associated with malnutrition (1, 2, 15, 29, 30). However, these relations are not always present in every society or community because of cultural differences and different levels of socioeconomic development (20, 31, 32). In Ghana, these relationships were not clear because of insufficient numbers of previous studies regarding this issue. The result of this study in urban Ghana supports the previous findings that parental education and occupational status can have a strong effect on the prevalence of malnutrition. In particular, a mother’s educational level is
supported as a strongly important factor.

A mother’s educational level is generally believed to be related to her hygienic performance and feeding practice in child care. Some reports demonstrated evidence of this relationship (5, 13, 33), but others did not show a significant association (30). In this study, although a mother’s education was not confirmed to be associated with her hygienic performance, it was confirmed to be associated with feeding frequency, a child-care indicator. Furthermore, a mother’s educational level was associated with support by both parents and their baby’s birth weight. This result indicates that although a child’s nutritional status is likely to be affected by many factors, it is especially affected by a mother’s educational level through feeding frequency or household income (financial support by both parents) and by birth weight.

We conclude that many factors such as birth weight, demographic condition, child care, and parental characteristics are involved in the prevalence of severe malnutrition, but that only a few factors, such as birth weight and number of siblings, were found to be involved in the prevalence of underweight. Moreover, we concluded that of these factors, birth weight and a mother’s education are the most important risk factors in the prevalence of severe malnutrition in urban children in Ghana. The results of this study suggest that the necessary measures for preventing malnutrition are i) the dissemination of a mother’s education for leading to qualified child care practices and stable income security, ii) the development of public health activities for reducing the birth of low-weight babies, and iii) the promotion of monitoring and care system for low-birth-weight babies.

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