Malnutrition among Pre-school Children in Alexandria, Egypt

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ABSTRACT

The study was conducted in Alexandria, Egypt, to assess the current status of malnutrition among 1,217 pre-school children aged 6-71 months. A two-stage cluster-sampling technique was used for selecting the sample. Data on sociodemographic and environmental characteristics of the family, morbidity profiles, and breast-feeding patterns were collected from mothers of the children. Anthropometric measurements were performed, and the prevalence of malnutrition was assessed using three indicators, such as stunting, under-weight, and wasting, following the WHO guidelines and cut-off points. Simple and multiple regression analyses were done for examining the factors associated with the occurrence of malnutrition using principal component factor analysis with varimax rotation. Stunting, under-weight, and wasting were observed in 15%, 7.3%, and 3.6% of the children respectively. High-socioeconomic condition was associated with low prevalence of stunting and under-weight (OR=0.67, confidence interval (CI)=0.55-0.8 and OR=0.75, CI=0.58-0.96 respectively). Good environmental condition was associated with a lower stunting rate (OR=0.83, CI=0.72-0.96). Increased age of child and living in a non-squatter area were associated with wasting (OR=1.02, CI=1.001-1.03 and OR=0.38, CI=0.15-0.97 respectively). Interventions to improve socioeconomic and environmental situations are recommended to reduce the already low level of protein-energy malnutrition further.

Key words: Infant nutrition disorders; Child nutrition disorders; Protein-energy malnutrition; Infant nutritional status; Child nutritional status; Egypt

INTRODUCTION

Information on child growth is helpful in monitoring trends, determining priorities, and evaluating the effectiveness of nutritional intervention programmes. Malnutrition, one of the most important global health problems, affects large numbers of children in developing countries (1). It is synonymous with protein-energy malnutrition (PEM) and signifies an imbalance between the supply of protein and energy and the body’s demand for these to ensure optimal growth and function. PEM, a consequence of various factors, is often related to poor quality of food, insufficient food intake, and severe and repeated infectious diseases, or, frequently, combinations of the three (2). The major outcomes of PEM during childhood may be classified in terms of morbidity (3), mortality (4), and psychological and intellectual development (5) with important consequences in adult life (6).

A recent WHO report states, “the stagnation of nutritional improvement combined with a rapid rise in population has resulted in an increase in the total number of malnourished children in all subregions of Africa.”
Consistently with this, the findings of the Egypt’s Multiple Indicators Cluster Survey reveal that malnutrition is still a serious problem (7).

Urbanization and inflow of migrants from rural to urban Alexandria lead to overcrowding and development of squatter areas in the city (8), resulting in a heavy pressure on food, environment, and health services as indicated in the community-based studies on the prevalence of malnutrition. The present study was carried out to assess the current status of malnutrition among pre-school children in Alexandria and to define its correlates.

MATERIALS AND METHODS

This cross-sectional study was conducted in Alexandria, Egypt during February-June 1998. A two-stage cluster-sampling technique, with probability proportionate to the size of population and a constant number of children per cluster at the second stage, was used. In the first stage, 30 clusters were selected based on probability proportionate to the size of population in different communities of seven districts of Alexandria. The 30 clusters were selected to assume a valid estimate of the prevalence of the problem. The study covered both urban and rural areas. In the second stage, 30 children, aged 6-71 months, from each cluster were selected to form the target population of the study. From a random starting point in each cluster, selection of households was started, and then search was made from door to door until 30 children (one per family) were selected. This sample size ensures, with probability of 95%, that the estimated prevalence is within ±5% of the true prevalence, irrespective of the prevalence and assumption of a design effect of 2. To represent the population of squatter areas, 10 clusters from 64 squatter areas were chosen. The total ‘required’ sample size stood at 1,200 children, whereas the actual number of pre-school children study was 1,217.

A pre-structured questionnaire was used for collecting data during the early months of 1998. Two teams—each comprising a nutritionist, an epidemiologist, a biochemist, and a local field facilitator—interviewed the mothers to collect information on the characteristics of children, such as age, sex, birth order, breast-feeding and morbidity patterns in the last two weeks, and family and environment characteristics, e.g. crowding index, source of water, sanitation facility, and refuse disposal. Anthropometric measurements (length, height, and weight) for each child were recorded following the method of Jelliffe et al. (9).

Double data entry was performed and checked for completeness and consistency. Statistical analysis was done by the SPSS package. The prevalence of PEM was assessed by the following indicators:

- **Stunting prevalence**: proportion of pre-school children below -2 standard deviations from the median height/length-for-age of the World Health Organization/National Center for Health Statistics (WHO/NCHS) reference population.
- **Under-weight prevalence**: proportion of pre-school children below -2 standard deviations from the median weight-for-age of the WHO/NCHS reference population.
- **Wasting prevalence**: proportion of pre-school children below -2 standard deviations from the median weight-for-height of the WHO/NCHS reference population.

Using principal component factor analysis with varimax rotation (10), the following four factors were extracted: (i) socioeconomic factors, such as education of mothers and fathers, number of assets, crowding index, and mother’s working status; (ii) environmental factors, such as storage of drinking water, sewage disposal, refuse disposal, and drinking water; (iii) gastrointestinal morbidity, such as diarrhoea and vomiting in the past two weeks; and (iv) respiratory morbidity scores (cough and fever in the past two weeks). These factors were used, in addition to place, age, gender, and birth order to be tested by simple and multiple logistic regression analyses, for determining the association of these factors with malnutrition.

RESULTS

The total sample included 1,217 children with the mean age of 35.1±19.7 months. Of these children, 633 (52%) were males, and 254 (21.1%) were currently breastfed. Four hundred sixty-five (38.3%) mothers and 281 fathers (23.2%) were illiterate. Only 107 (8.8%) mothers were working outside the home. Nine hundred seventeen mothers (75.3%) had piped water supply in their houses, and 934 (76.7%) disposed refuse in covered containers (Table 1).

Anthropometric measurements were available for 1,214 children (99.8%) (Table 2). Fifteen percent were stunted (16.8% males, 13.1% females), 7.3% were underweight (8.6% males, 5.5% females), and 3.6% were wasted (3.8% males, 3.4% females). The prevalence of
under-weight was significantly higher among girls than boys (p<0.05).

Table 3 shows that the increased birth order was associated with the increased prevalence of stunting (OR=1.11, confidence interval (CI)=1.00-1.22), and the high socioeconomic and environmental conditions were significantly associated with low prevalence of stunting (OR=0.66, CI=0.55-0.8 and OR=0.82, CI=0.7-0.95 respectively). The prevalence of under-weight increased with age of child (OR=1.01, CI=1.00-1.02) and decreased with high-socioeconomic condition (OR=0.75, CI=0.58-0.96). Living in non-squatter areas was associated with the low prevalence of wasting (OR=0.39, CI=0.15-0.99).

The results of multivariate logistic regression (Table 4) showed that the socioeconomic factors were associated with stunting and under-weight (OR=0.67, CI=0.55-0.81 and 0.75, CI=0.58-0.96 respectively). The environmental factors were significantly associated with stunting (OR=0.83, CI=0.72-0.96). The increased age of child and living in non-squatter areas were independently associated with wasting (OR=1.02, CI=1.00-1.03 and OR=0.38, CI=0.15-0.97 respectively).

**DISCUSSION**

Assessment of growth is the single measurement that best defines the nutritional and health status of children, and provides an indirect measurement of the quality of life of the entire population. The findings of growth assessment in the present study revealed that 15% of the children were stunted signifying a mild public-health problem in Alexandria according to the WHO criteria (11). This figure is lower than the figure of 24.9% reported by the Egypt Demographic and Health Survey 1997 (EDHS) (1,2) and 21% by the Egypt's Multiple Indicators Cluster Survey (EMICS) 1996 (7).

Stunting measures cumulative deficient growth associated with the long-term factors, including insufficient dietary intake, frequent infections, poor feeding practices over a sustained period, and low socioeconomic status of households (13). This was quite evident in the present study where the high socioeconomic level and the good environmental status were found to be protective against stunting. The decline in the prevalence of stunting as observed in the present study compared to the previous two studies (7,12) may be attributed to the improvement of these two factors.
Under-weight was prevalent among 7.3% of the total children examined, i.e. under-weight can be classified as 'low' according to the WHO criteria (11). This figure is compatible with the figure of 8% reported by the EMICS 1996 and lower than the overall prevalence rate of under-weight (11.7%) estimated in the EDHS 1997 (12).

Under-weight reflects achieved body mass to chronological age and is the most commonly-used nutritional indicator in defining malnutrition. Globally, the prevalence of malnutrition as measured by low weight-for-age has progressively fallen in developing countries from 42.6% in 1975 to 31% in 1995 (2).


The findings of logistic regression demonstrated that higher socioeconomic level was associated with a lower risk of under-weight (OR=0.75, CI=0.58-0.96). This is in agreement with the findings of the study on PEM in upper Egypt, which indicated that low economic level was associated with an increased risk of under-weight, stunting, and wasting (14). Socioeconomic determinants play a significant role in quantitative and qualitative

<table>
<thead>
<tr>
<th>Variable</th>
<th>Stunting (n=182)</th>
<th>Under-weight (n=89)</th>
<th>Wasting (n=44)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio</td>
<td>95% CI</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>Age (in months)</td>
<td>1.01 1.00–1.02‡</td>
<td>1.00 1.00–1.03‡</td>
<td>1.01 1.00–1.03‡</td>
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<tr>
<td>Gender</td>
<td>0.67 0.43–1.04</td>
<td>1.00 0.88–1.17‡</td>
<td>0.88 0.67–1.17‡</td>
</tr>
<tr>
<td>Birth order</td>
<td>1.02 0.90–1.18</td>
<td>0.88 0.76–1.03</td>
<td>0.88 0.76–1.03</td>
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<td>Non-squatter residence</td>
<td>0.61 0.36–0.98</td>
<td>0.88 0.60–1.20</td>
<td>0.88 0.60–1.20</td>
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<tr>
<td>Rural residence</td>
<td>0.60 0.39–0.91</td>
<td>0.88 0.63–1.20</td>
<td>0.88 0.63–1.20</td>
</tr>
<tr>
<td>Socioeconomic factors*</td>
<td>0.66 0.55–0.98†</td>
<td>0.71 0.52–1.00</td>
<td>0.71 0.52–1.00</td>
</tr>
<tr>
<td>Environmental factors†</td>
<td>0.56 0.72–0.87†</td>
<td>0.71 0.52–1.00</td>
<td>0.71 0.52–1.00</td>
</tr>
<tr>
<td>Gastrointestinal morbidity§</td>
<td>1.00 0.90–1.20</td>
<td>0.71 0.52–1.00</td>
<td>0.71 0.52–1.00</td>
</tr>
<tr>
<td>Respiratory morbidity¶</td>
<td>1.02 0.90–1.20</td>
<td>0.71 0.52–1.00</td>
<td>0.71 0.52–1.00</td>
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<thead>
<tr>
<th>Protein-energy malnutrition</th>
<th>Independent variable</th>
<th>Odds ratio</th>
<th>95% CI</th>
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<tr>
<td>Stunting</td>
<td>Socioeconomic factors*</td>
<td>0.67</td>
<td>0.55–0.81</td>
</tr>
<tr>
<td></td>
<td>Environmental factors†</td>
<td>0.83</td>
<td>0.72–0.96</td>
</tr>
<tr>
<td>Under-weight</td>
<td>Socioeconomic factors*</td>
<td>0.75</td>
<td>0.58–0.96</td>
</tr>
<tr>
<td></td>
<td>Age of child in months</td>
<td>1.02</td>
<td>1.01–1.03</td>
</tr>
<tr>
<td></td>
<td>Non-squatter residence</td>
<td>0.38</td>
<td>0.15–0.97</td>
</tr>
</tbody>
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adequacies of the consumed diet and, consequently, on nutritional and health status of individuals (15).

Wasting was prevalent in about 3.6% of the total children in our study, indicating low severity according to the WHO criteria (11). A study done in 1990 on infants and pre-school children in Alexandria well-baby clinics to assess their growth status revealed that wasting was present in 5.5% of children examined (16).

Wasting reflects body proportions, is particularly sensitive to acute growth disturbances (11), and is due primarily to insufficient energy intake and repeated infections. Higher energy availability, higher literacy of females, higher immunization rates, and higher gross national product are the most important factors associated with the lower prevalence of stunting and wasting (17).

The results of multivariate analysis in the present work demonstrated that increase in age of child enhances the risk of wasting. Besides, the males had higher levels of stunting and under-weight than had the females. This is in agreement with the findings of the national survey of 1997 that revealed that stunting was more common among males (18).

The present study provided information that malnutrition constitutes a mild public-health problem among the pre-school children in Alexandria. High socioeconomic and good environmental conditions were the most important factors associated with the lower prevalence of malnutrition. Interventions to improve socioeconomic and environmental situations are recommended to reduce the already low level of PEM further.

ACKNOWLEDGEMENTS
The study was done in collaboration with UNICEF and the Maternity and Child Health Section of the Ministry of Health and Population, Egypt.

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