Child malnutrition: Magnitude of problem, diagnosis and management
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Summary
Malnutrition is a major public health problem in the region of South Asia. The situation perhaps more worse in Bangladesh with 40-50% low birth weight, 53% of under five children are underweight and 55% are stunted. This situation of "silent emergency" calls for special attention. Bangladesh Government in association with other international organizations initiated Bangladesh Integrated Nutrition Project (BINP) to combat the malnutrition situation. The project provides food supplementation to all severely malnourished children under 2 years of age and targeted pregnant and lactating mothers. With the success of preliminary results of BINP, the Government of Bangladesh will launch a National Nutrition Program for next ten years to improve the malnutrition situation.

Although, it is a governmental effort, the problem of malnutrition perhaps is multifactorial and need involvement of various sectors and people of different disciplines. The purpose of this review is to identify the problem and provide practical guidelines for the health professionals for correct diagnosis and management for malnutrition.

Introduction
Magnitude of Problem: Malnutrition remains a significant public health problem in developing countries including Bangladesh. Malnutrition is one of the leading causes of childhood morbidity and mortality. According to WHO report about 10.4 million under-5 children die each year in the developing countries and about 50% of them are malnourished. In a recent publication of UNICEF, it has been estimated that about 60% of all children under five-year in Bangladesh are malnourished. About 53% of the children under-5 is underweight and 55% are stunted. The problem of protein energy malnutrition (PEM) is related to several factors that include: insufficient food supply, poor dietary habits, malabsorption of foods during infection, food withholding, and recurrent infections due to diarrhoea, respiratory infections, and malaria. Nevertheless, about 40-50% of babies are born as low birth weight that can never attain adequate growth during the later part of their life.

Inappropriate breastfeeding and untimely complementary feeding practices are also major factors for poor nutritional status in children less than two years. Although, UNICEF/WHO are recommending exclusive breast-feeding until about six months and starting of complementary food at six months and continued breast feeding up to two years, the rate of exclusive breast feeding remained low with 15-20%. Appropriate complementary foods are usually started either too early or too late. Therefore, a significant number of infants become malnourished. They are also at higher risk of having diarrhoea, ARI and other infections. Moreover, these children are more likely to die before their first birth date.

Beside protein energy malnutrition (PEM), other forms of micronutrient deficiencies such as iron deficiency anaemia, vitamin A deficiency, iodine deficiency disorder (IDD) and zinc deficiency are also highly prevalent in Bangladesh. It is therefore, pertinent to address these issues if an effective nutrition intervention programme is undertaken to combat malnutrition in Bangladesh.

Country Programs and GoB initiatives: Considering the magnitude of the problem and potential adverse effects on human resource, Bangladesh Government has initiated Bangladesh Integrated Nutrition Project (BINP) since 1996. The major components of the project to provide supplementary foods to severely malnourished children less than two years, pregnant women with BMI < 18.5, and con-
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tinue this supplementation to lactating mothers during first six months. This project has been started initially in 20 thanas and further expanded to a total of 60 thanas. The food supplementation is provided through a Community Nutrition Centre (CNC) with a population of approximately 1000-1500. This project is on-going for last four years and is expected to finish by December 2001. A mid term evaluation showed substantial improvement in reducing rate of severely malnourished children (from 18% to 6%), moderate reduction in proportion of low birth weight.

Observing the success with BINP, Bangladesh Government is planning to launch a countrywide programme “National Nutrition Program (NNP) to be started in 2001. The additional components in this new programme include; urban nutrition, adolescent nutrition, newly-married couple strategy and more emphasis on behavioural and communication changes (BCC).

Diagnosis of malnutrition
Precise evaluation of nutritional status is difficult. Severe malnutrition is apparent, but mild deficiency may be overlooked even after careful physical and laboratory examinations. The diagnosis of malnutrition depends on accurate dietary history, on evaluation of present deviations from average anthropometric parameters, such as bogy weight, height, mid arm circumference and skin fold thickness.

Anthropometry (measurement of nutritional status) : Weight and height are probably the two important measurements that can be taken to assess the nutritional status of a population. Like all measurements, however, they are subject to bias and errors in recording if they are not properly standardized. Few steps are necessary to obtain good measurements.

• Train the health personnel in the proper methods of using the measuring apparatus and scale.
• Adjust the scales regularly before each measuring session.

Body weight: Body weight of the child should be measured on a standard scale, either nude or with minimum cloths. At least three measurements should be taken and an average of three should be recorded.

Length: For children less than two years recumbent length (crown-heel length) has to be measured. This is usually carried out on a wooden length board. The child is laid on the board, which is itself, a flat surface. The head is positioned firmly against the fixed headboard, with the eyes looking vertically. The knees are extended, usually by firm pressure applied by the assistant, and the feet are flexed at right angles to the lower limbs. The upright sliding footpiece is moved to obtain firm contact with the heels and the length read to the nearest 0.1 cm.

Height: For older children, more than two years, a vertical measuring rod or stadiometer can be employed. The child should stand on a flat surface by the scale with feet parallel and heels, buttock, shoulder and back of the head touching the upright. The head should be held comfortably erect, with lower border of the orbit of the eye in the same horizontal plane as the external canal of the ear. The arms should be hanging loosely at the sides. The headpiece of the measuring device, which is usually a metal bar or wooden block, is gently lowered and placed on the top of the head firmly. At least three measurements should be taken and average of three should be recorded.

Classification of malnutrition
Gomez classification: This classification is based on ideal weight-for-age, which is derived from a reference growth chart National Centre for Health Statistics (NCHS). This classification has three categories; 1) First degree or mild, 2) second degree or moderate, and 3) third degree or severe malnutrition. The calculation is being done as percent of 50th centile of NCHS, which is obtained by measuring the actual body weight of the child and dividing it by the median body weight from the NCHS growth chart.

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1) First degree malnutrition: weight-for-age, 76.90% of NCHS median
2) Second degree malnutrition: weight-for-age, 60-75% of NCHS median
3) Third degree malnutrition: weight-for-age, < 60% of NCHS median.

Waterlow classification

Underweight: Underweight is a measure of malnutrition according to the weight-for-age. It indicates a deficit in body weight for child of the same age and sex.
Stunting: Stunting is a measure of malnutrition according to the height-for-age. It indicates reduced growth in height/length compared to the expected height for a child with same age and sex. Stunting is usually end result of chronic energy deficiency.
Wasting: Wasting is a measure of malnutrition according to the weight-for-height. It indicates deficit in body weight for a child with same height and sex. Wasting usually indicates acute energy deficiency.

Clinical classification

This is also called Welcome classification and categorized as 1) Kwashiorkor, 2) Marasmus, and 3) Marasmic-kwashiorkor. Clinical classification is based on weight-for-age, but added on presence of pedal edema.
Kwashiorkor: Kwashiorkor is defined as child having weight- for-age > 60% of NCHS median with edema. Usually other clinical signs such as hepatomegaly, typical skin rash and hyperpigmentation, friable discoloured hair.
Marasmus: is defined as a child having weight-for-age < 60% of NCHS median without edema. The patient with classical marasmus has obvious gross loss of muscle, particularly of the buttocks and loss of subcutaneous fat. The pinched look of the face gives an "old man" look.
Marasmic-Kwashiorkor: is defined as a child having weight- for-age < 60% of NCHS median and with pedal edema.

Management of severe malnutrition

Management of severe malnutrition can be divided into three phases; acute phase, rehabilitation phase and follow-up phase.

Acute phase: In a recent study at ICDDR,B a standardized management protocol has been found to be effective and reduced the mortality by nearly half. (Lancet, 1998). The principles of the acute phase treatment are to stabilize the patients and correct dehydration, electrolyte imbalance, hypoglycemia, and more importantly treatment of infections.

Infections: Usually an underlying infection is present in most severely malnourished cases. Because of poor inflammatory response, the usual physical signs of infections are not obvious, infections expresses itself as apathy, drowsiness, hypothermia, hypoglycemia and death. A broad-spectrum antibiotic coverage should usually be started. An easily digestible liquid diet should be started as soon as possible and at regular intervals, to prevent hypoglycemia.

If the child is dehydrated and has diarrhoea, oral rehydration solution (WHO-ORS) can be given. Although, some authors recommends a low sodium and high potassium containing ORS, which has been shown to be effective. The child should also receive a micronutrient-vitamin syrup as most of the children with severe malnutrition have multiple nutrient deficiency.

Dietary management

Children should be started with a semi-soft diet and total energy should not exceed 80-90 kcal/kg/day. Because the amount of food that the intestine, liver, and kidney can handle is limited. Therefore, the diet must be divided into many small feeds at frequent intervals. The diet should contain all the essential nutrients (minerals, vitamin, protein, energy, and fat).

Rehabilitation phase

The appetite is used as a barometer of progress. The return of appetite means the infections are under control and there is no major electrolyte imbalance. The duration of the acute phase is usually about 5-7 days. After which the amount of diet and energy should gradually be increased up to 150-180 kcal/kg/day to attain catch-up growth. The
child should be offered the food frequently and encouraged to eat more. During this period a home based diet such as khichuri with added oil can be offered to the child. It usually takes about 2-3 weeks to attain a growth that child can be discharged and asked to come for follow-up.

Follow-up: The child should be asked to come at least every fortnight to come for follow-up at a day care follow-up centre. The child should be monitored for growth and development and any illness should be reported. Mothers or care-givers also should be given health and nutrition education with regards to proper caring practices.

**Conclusion**
The problems of malnutrition are multifactorial and deserve concerted efforts by various sectors, the society as a whole, at medical, social, ethical, moral and political levels. Malnutrition amongst children and the elderly is the most common serious illness in the world today. The legacy of childhood malnutrition is to be seen in adult who is stunted physically and mentally. More recent studies indicate that childhood malnutrition is a risk factor for many chronic diseases in adulthood.

**Suggested further reading**