

Classifications of Undernutrition—their Limitations and Fallacies

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During the last few years, there have been several attempts at 'classifications' or 'gradings' of the severity of undernutrition in children. In most of these exercises, the severity (and/or the 'type') of growth retardation observed in the children has been used as the yard-stick. These classifications have found wide application in many developing countries for the dual purposes of (a) quantifying the extent and severity of undernutrition in poor communities, and (b) choosing 'beneficiaries' for nutrition intervention programmes, the beneficiaries being generally those showing severe grades of growth retardation. These classifications cannot, therefore, be dismissed as arm-chair academic exercises. When widely applied for practical purposes, they carry with them potential policy implications. For this reason, the physiological validity of these exercises and their actual practical values have to be critically examined. Unquestioning use of such grading exercises as the basis for decisions regarding the extent and severity of undernutrition in the community, without proper appreciation of the inherent fallacies and limitations of the method can be misleading. For the practical purpose of remedial action such mistakes could lead to undesirable distortions of priorities and of nutrition policies and programmes of developing countries. Much of the debate so far has been about the choice of appropriate standards for assessing the degree of growth retardation. The more basic question of the propriety of measuring undernutrition in a community solely on the basis of observed 'grades' of growth-retardation has hardly been raised. In this paper some of the fallacies and limitations of such an approach are briefly examined.

It was nearly three decades ago that Gomez and his associates¹ attempted the grading of undernutrition on the basis of the degree of growth-retardation, the latter being assessed on the basis of degree of deficit of weight for age as measured against a standard. The cut-off points for the different 'grades' employed by them—weight/age between 90 per cent and 75 per cent of standard (mild); between 75 per cent and 60 per cent (moderate); and below 60 per cent (severe)—were purely arbitrary. The authors did not claim any physiological or pathological basis for these cut-off points; all that was apparently intended was that such grading would provide a broad indication of the

appropriate immediate clinical management of these cases and no more. It is doubtful if at the time of proposing the grading, these authors ever envisaged its wide application as the basis for determining directions of nutrition policies and programmes of developing societies.

In subsequent years, there have been several attempts at refining the categorization of 'growth retardation'. In these latter exercises, apart from weight, height has also been taken into consideration.^{2,3} Waterlow's attempt to distinguish 'stunting' from 'wasting' was a useful contribution which stimulated considerable interest in the dynamics of the process of growth retardation. Waterlow, again, rightly did not attempt to invest his categorization with policy implications; in brief, his was an attempt at not merely identifying the severity of growth retardation but also broadly distinguishing the 'types'.

The factual position, however, is that all the gradations and classifications of growth retardation proposed so far (including the more recent ones) have no proven physiological validity *as indicators of the severity of undernutrition*. They are no more than classifications of the degree and type of growth retardation of the children of the community as a whole. The grade of growth retardation *in an individual child* observed at a particular point of time, does not have a predictive or prognostic value with respect to future course of growth performance in that child. This is especially so where young children below 3 years of age are concerned. For reasons discussed below, it is even less reliable as an indicator of the precise current severity of undernutrition in the child, let alone of its possible future nutritional status. It is for this reason that public health workers are advised to take repeated periodical growth measurements in the same child.

The very fact that several studies directed towards elucidating the 'functional significance' of different degrees and types of growth retardation have yielded results which are by no means convincing or clear-cut, even when only a small battery of functional tests were employed, bears ample testimony to the fact that inferences about the degree of impairment of a wide range of functions on the basis of the observed degree of growth retardation at a given point of time will be misleading and unjustified.

The Dynamics of the Undernutrition Process

In children of poor communities, habitually subsisting on inadequate diets, there is a continuous and insidious transition from the stage of normalcy usually obtaining till about the fourth or sixth month (many infants being small-for-date may never start from normalcy), to that of full-fledged clinically manifest undernutrition which generally supervenes before the third year. The speed of this downward slide will depend on the extent of the dietary inadequacy, its duration, and the presence or absence of superadded aggravating factors, like infection. In poor communities, we may expect to see children in different stages of this transition. Not all children will go through the entire transition; the downward slide may be arrested at different stages or it may be so slow that the child may manage to cross the critical age period of 4 to 5 years before the 'end point' is reached. It is necessary to emphasize that unlike in many infectious diseases, in the case of undernutrition, there is no clear point of onset and no easily discernible dividing line between normalcy and 'disease'. A considerable proportion of children, presently in the 'mild' grade of growth retardation, are potential candidates for the 'moderate' and 'severe' grades; those presently in the 'severe' grades were probably in the 'mild' and 'moderate' categories a few weeks or months earlier. A fortunate small proportion may even reverse their direction.

If this dynamics of the evolution of undernutrition (which will be obvious in longitudinal studies) is understood, there can be no complacency regarding 'mild' and 'moderate' degrees of growth retardation. The children in the 'mild' and 'moderate' degree of growth retardation are clearly at-risk and deserve attention. From the economic point of view, and the point of view of health of the individual child, it must be obvious that the protection of children in 'mild' and 'moderate' degrees will call for far less resources and will prove far more rewarding than nutritional rehabilitation operations directed solely to the most 'severely' malnourished—the severity being decided by an arbitrary threshold of no proven physiological validity.

The fallacies and limitations of exercises designed to grade undernutrition on the basis of the degree (or type) of growth-retardation stem from the following considerations: (a) the multi-dimensional nature of the undernutrition process, (b) the plurality of nutrient deficiencies, and (c) the complex multi-factorial interactions (both of factors within the environment and of those between the host and the environment) involved in the evolution of undernutrition in poor communities. We may briefly consider these factors.

The Multiple Dimensions of the Process of Undernutrition

Even if we are dealing with a single nutrient deficiency (which is rarely the case), the resulting process

of undernutrition will be governed by the velocity, the intensity, and the duration of the deficiency. Thus the deficiency could be 'acute mild', 'acute severe', 'chronic mild', 'chronic severe' or 'chronic (mild or severe) with periodic acute (mild or severe) exacerbations'. This multi-dimensional nature of the undernutrition process will be reflected in the pattern of growth. Under these circumstances, even more important than the child's current position in the growth-chart, will be the *route* which that child took in order to arrive at that point. Thus, for example, a stunted child of 3 years of age in Waterlow's classification (with both height/age and weight/age being subnormal but with normal weight/height) could have arrived at that point through one of several routes. The child could have been severely marasmic with marked retardation in height and much greater retardation in weight (wasted and stunted) till about the end of its second year; thereafter due possibly to environmental and dietary changes, the velocity of the downward slide could have been arrested, and the child could have gained a lot more weight than height in the next few months to end up with a normal weight/height ratio by the third year. Another child could have arrived at exactly the same point through suffering a sustained and steady state of undernutrition of relatively lower velocity and severity with the result that its weight/height remained normal right through. These two children, one which had to pass through a severe stage of marasmus or marasmic kwashiorkor, and the other which had managed to escape such a severe episode, though identical with respect to their current anthropometric status, cannot be expected to be nutritionally and functionally on par.

It has been well-known for a long time that classical kwashiorkor (as opposed to marasmic kwashiorkor) can develop in children who show a much less weight deficit than many other undernourished children in the community. It is generally agreed that kwashiorkor, associated as it is with fatty liver, pancreatic insufficiency, significant decline in serum albumin and key serum and internal enzymes (unlike marasmus) represents a very severe form of undernutrition. The fact that such severe indisputable clinical undernutrition can supervene in children showing less severe degrees of growth retardation is yet another illustration of a lack of parallelism between the degree of growth retardation and the degree of undernutrition.

The nutritional significance of the degree of growth retardation will also depend obviously on the age of the child. For example, a mild degree of growth retardation in an infant of 6 to 8 months would carry quite a different significance from the same order of growth deficit in a child 5 years of age. The former is entering the most vulnerable period of growth and the latter is just emerging from it. Unfortunately, in most attempts at quantification of undernutrition on the basis of classifications based on the severity of growth

retardation all children below 5 years are treated as a single category.

Plurality of Nutrient Deficiencies

Children in poor communities suffer not merely from calorie deficiency but from other nutrient deficiencies as well. Thus Indian children in poor rural communities suffer from moderate and severe iron deficiency anaemia (63 per cent of children below 3 years belonging to poor rural communities were found to suffer from such anaemia), vitamin A deficiency, and less frequently from deficiencies of vitamins of the B group. The severity of deficiency of the different nutrients does not necessarily run parallel, possibly because of differences in the composition of the diets and differences in the efficiency of absorption of different nutrients. The severity of iron or vitamin A deficiency may show a much lower positive correlation with the severity of weight deficit, than the severity of calorie deficiency. Under the circumstances different combinations of multiple nutrient deficiencies of varying orders of severity are seen in poor children. It is difficult to decide if a child with moderate growth retardation and a haemoglobin level well below 6 gm per cent is nutritionally better off than one with severe growth retardation and a haemoglobin level above 10 gm per cent; or again, whether a child of 18 months of age with 'severe' growth retardation but with a clear white conjunctive (as used to be frequently seen in Uganda) is worse off than a child of the same age with 'moderate' growth retardation but with severe conjunctival xerosis. A recognition of these complexities should serve to caution us against simplistic suggestions that we could largely ignore 'mild' and 'moderate' grades of growth retardation and concentrate our attention only on severe grades of growth retardation.

Multi-factorial Interactions

Growth retardation in children need not be due to dietary inadequacies alone. It may be aggravated and compounded by infections of various kinds which are inherent in the environmental situation. The type and nature of the infections will also vary widely. The relative contributions of infection and dietary deficiency to the resultant picture of growth retardation may vary from one community to another depending on the environmental sanitation. Within a given community it may vary from one child to another depending on exposure to infection. Moderate growth retardation due predominantly to dietary deficiency and the same degree of growth retardation brought about by a combination of dietary deficiency and infection may imply differences with regard to functional and nutritional status. Differences in the type and nature of the associated infection, its frequency and severity and its response to treatment may account for entirely different prognostic and functional significance of a given order of growth

retardation. A child with minimal growth retardation might have suffered a severe recent bout of infection and might have suffered a temporary loss of weight; it would be classified as wasted; another child of the same age with no (or minimal) infection but with persistent dietary deficiency might have arrived at the same weight but in a stunted state (meaning with added height deficit). The question as to which of the two children is nutritionally worse off would depend very much on the nature of the infection, its response to treatment and its residual effect on appetite and intestinal absorption. Any judgement based purely on the current anthropometric state will be misleading.

It must be obvious from the foregoing considerations that severity of growth retardation alone, is an inadequate yard-stick for the measurement of the severity of undernutrition in children. It cannot take into account all the different dimensions of the undernutrition process. Apart from the factors mentioned earlier, retardation in physical growth cannot tell us anything much about mental and more importantly behavioural changes which are now emerging as an extremely important attribute of the undernutrition syndrome. The effect of iron deficiency on behaviour mediated through changes in the metabolism of the neurotransmitters and levels of dopamine and catecholamines is now being better understood and iron-deficiency anaemia is a much more widespread and severe problem among young children in India than we had imagined. It is doubtful if a single convenient index which can take into account the complex and multiple facets of undernutrition can ever be developed. Under the circumstances, data on the degree of growth retardation must be supplemented by other relevant data related to undernutrition, in order to enable us to arrive at judgements on the severity of undernutrition in an individual child or community.

Concluding Comments

It is certainly not the purpose of this paper to minimize the importance of anthropometric measurements in the assessment of nutritional status. It is agreed that periodic anthropometric measurements (especially weight measures) have an important place in child care. But the object of such measurements is *early detection* of deviations from normalcy so that appropriate remedial action can be promptly instituted at the home level itself. If the postulate that we may ignore 'mild' and 'moderate' degrees of growth retardation on the ground that they may signify states of 'adaptation' of the child to undernutrition ('small is beautiful') and that we need take note only of the 'severe' grade of growth retardation is accepted, then periodic weight-recordings would be wholly unnecessary and can be dispensed with; because even the illiterate mother can certainly recognize growth retardation of an order exceeding 40 per

cent of the normal, without the aid of weighing scales! The manner in which 'classifications' of growth retardation are sought to be applied in the conduct of practical nutrition programmes, would make the monthly weighings of children in the course of domiciliary visits by health personnel, a mockery and meaningless ritual.

The quantum of cases of 'severe' undernutrition in a poor community will considerably exceed the quantum of cases of 'severe' growth retardation, because while all 'severe' cases of growth retardation will undoubtedly be also severely undernourished, not all cases of 'severe' undernutrition will be necessarily severely growth retarded. Severe undernutrition can exist in the absence of 'severe' grade of growth retardation.

It will be poor strategy to ignore 'mild' and 'moderate' grades of growth retardation, because (a) these groups (particularly the 'moderate') could include some current cases of severe undernutrition, and (b) many of these children may eventually

progress to the 'severe' stage of growth retardation and to severe undernutrition if current environmental and dietary constraints persist. The hypothesis that 'mild' and 'moderate' growth retardation could represent a state of adaptation springs from misinterpretation of the true meaning of adaptation; the propagation of this hypothesis can only lead to the perpetuation of the current scenario of undernutrition in developing countries, and will serve to undermine the quality of their human resources.

References

1. Gomez F, Galvan RR, Cravioto J, Frenk S. Malnutrition in infancy and childhood, with reference to kwashiorkor. *Adv Pediatr* 1955; 7: 131-69.
2. Sloane N, Latham MC. Nutritional anthropometry in the identification of malnutrition in childhood. *J Trop Pediatr Environ Child Hlth* 1971; 17: 98-104.
3. Waterlow JC. Note on the assessment and classification of protein energy malnutrition in children. *Lancet* 1973; 2: 87-9.

Current Breast-Feeding and Weaning Practices in Haiti

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The Republic of Haiti occupies the western one third of the island of Hispaniola, the second largest island in the Caribbean. It shares a common border with the Dominican Republic which occupies the eastern two-thirds of the island. Haiti has a land area of about 11,000 square miles, most of which is mountainous. The estimated 1978 population is 4.8 million persons. Sixteen per cent of the population, about 840,000, are under age 5. Approximately 23 per cent of the population live in urban areas, the largest of which is Port-au-Prince, with a population of 800,000. The population density per square kilometer is 186 but measured in terms of arable land, the average density exceeds 580 persons per square kilometer.¹

The Haitian economy is primarily agricultural. Most Haitian farmers live in scattered villages on small land holdings growing coffee and food crops. There are some plantations where sugar cane is grown but most of the agrarian economy is at the subsistence level. Food imports are needed to prevent widespread famine. Per capita income was estimated at less than \$200 in 1978, ranking Haiti among the world's least developed nations.

Nutritional deficiencies have been cited among the most serious health problems in Haiti. A number of national nutritional surveys have been undertaken since 1958.²⁻⁴ These studies used the Gomez index of weight for age⁵ to estimate the prevalence of malnutrition. Direct comparisons of data from these surveys are difficult because of differences in survey methodology, in the time of the year when the surveys were conducted, and in the use of various reference standards. King⁶ has summarized the survey results.

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