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## 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 yardstick. These classifications have found wide application in many developing countries for the dual purposes of (1) quantifying the extent and severity of undernutrition in poor communities, and (2) choosing “beneficiaries” for nutrition intervention programmes, the beneficiaries being generally those showing severe grades of growth-retardation. These classifications cannot, therefore, be dismissed as armchair academic exercises. When widely applied for practical purposes, they carry with them potential policy implications. For this reason, their physiological validity and their actual practical value have to be critically examined. Unquestioning use of such classifications, without proper appreciation of their inherent fallacies and limitations, could lead to undesirable distortions of Plan priorities and of nutrition policies and programmes of developing countries. Much of the debate so far has been on 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

this approach are briefly examined.

It was nearly three decades ago that Gomez and his associates (Gomez F., Galvan R.R., Cravioto J., Frenk S. : *Adv. Paed.* 1955. 7.131-169) 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 percent and 75 percent of standard (mild); between 75 percent and 60 percent (moderate); and below 60 percent (severe) — were purely arbitrary. The au-

thors did not claim any physiological or pathological basis for these cut-off points; it is doubtful if these authors ever envisaged its wide application in determining nutrition policies and programmes of developing societies.

In subsequent years, there have been several attempts at refining the classification of ‘growth-retardation’ where apart from weight, height has also been taken into consideration (e.g., Sloane N. and Latham M.C. : *J. Trop. Paed. Env. Child Health* 1971. 17.8-104. Waterlow J.C. : *Lancet* 1973. 2. 87-89).

Waterlow’s attempt to distinguish ‘stunting’ from ‘wasting’ was a useful contribution which stimulated considerable interest in the dynamics of the growth-retardation process. It was an attempt at not merely identifying the severity of growth-retardation but also at broadly distinguishing the ‘types’. Waterlow, again rightly, did not attempt to invest his categorisation with policy implications.

The factual position, however, is that all the gradations and classifications of

**Extract from the address of the Prime Minister, Mrs. Indira Gandhi, at the Silver Jubilee celebrations of the A.N. Sinha Institute, Bihar, on January 9, 1984.**

“... A Nutrition Foundation study has shown that the birth rate and infant mortality rate are much lower in Kerala than in Punjab, because of higher literacy among Keralite women. But the nutrition level of children in Kerala is much lower than in Punjab. Here is an example which shows that enduring development needs balanced emphasis on production and human development. From Jawaharlal Nehru’s time we have been conscious of the economic, social and political factors involved in the process of development. Our planning has included not only economic programmes to improve production and productivity but also special programmes for backward regions, groups of underprivileged people, the spread of education, health and welfare, agrarian and organisational reforms and many more. But imbalances persist. We have to pursue more vigorously the basic minimum needs programme....”

growth-retardation proposed so far (including the more recent ones) have no proven physiological validity as *indicators of the severity of undernutrition*. The grade of growth-retardation observed at a particular point of time *in an individual child* does not have a predictive or prognostic value with respect to the future course of growth-performance in that child (especially where young children below three years of age are concerned). It is for this reason that public health workers are advised to take repeated periodical growth measurements in the same child.

### **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 four to five years before the 'end point' is reached. It is necessary to emphasise 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 these dynamics of the evolution of undernutrition (which will be obvious in longitudinal studies) are understood, it will become obvious that children in the 'mild' and 'moderate' degrees of growth-retardation are also clearly at risk and deserve attention. From the economic point of view, and the point of view of the 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: (1) the multi-dimensional nature of the undernutrition process, (2) the plurality of nutrient deficiencies, and (3) 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". 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 three years of age in Waterlow's classification (with both height/age and weight/age being subnormal but with normal wt/ht) 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 intensive "nutritional rehabilitation," 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 wt/ht 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 wt/ht remained normal right through.

These two children, one of 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. Admittedly, we do not as yet have studies which provide categorical evidence on this point, but the Foundation is already gathering such evidence.

It has been well-known for a long time that classical kwashiorkor (as opposed to marasmic kwashiorkor) can set in in children who show a much less weight deficit than many other undernourished children in the community. Reports of the classical "fat sugar babies" of Jamaica are well-known. It is generally agreed that kwashiorkor, associated as it is with fatty liver, pancreatic insufficiency, significant decline in serum albumin and key serum and intestinal enzymes (unlike marasmus) represents a more severe form of undernutrition than marasmus. 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 six to eight months would carry quite a different significance from the same order of growth deficit in a child five 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 five 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 percent of children below three years belonging to poor rural communities were found to suffer from such anaemia, according to one study of the National Institute of Nutrition), vitamin A deficiency, and less fre-

quently, 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 six gms percent is nutritionally better off than one with "severe growth retardation" and a haemoglobin level above 10 gms percent or again, whether a child of 18 months of age with 'severe' growth retardation but with a clear white conjunctiva (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 due to undernutrition may be aggravated and compounded by various infections. 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 state of environmental sanitation: even within the 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 and response to nutritional rehabilitation. Infections (especially acute and subacute) imply increased energy requirement, increased nitrogen loss and relative refractoriness to simple nutritional rehabilitation measures.

Apart from the presence or absence of infection, 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 recently acquired infection and might have therefore suffered a recent 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* by itself, is an inadequate yardstick for the measurement of the severity of *undernutrition* in children. It cannot take into account all the different dimensions of the undernutrition process.

In fact 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 minimise 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 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.

The quantum of cases of 'severe' un-

dernutrition 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.

Growth is motion. Anthropometry at a given point of time can at best provide only a 'still picture' of this dynamic process of motion. One-point anthropometric measurements applied to *whole communities* may provide a cross-sectional picture of some value; but such one-point measurement can prove most misleading when applied to an individual child. Hence the need for growth monitoring in the case of the individual child.

It is not suggested that "classifications" which have now acquired the merit of wide usage should be totally dispensed with. They will still be useful in quantifying the extent and degree of *growth-retardation* of children and provide an indirect indication of the degree of underdevelopment of a community; they may also provide a rough indication of the quantum of undernutrition *in the community as a whole* and of the impact of nutrition intervention programmes among children. But they must be used and interpreted with considerable caution and circumspection and with full appreciation of their limitations in the assessment of the nutritional status of any individual child. The cut-off points in these 'classifications' must not be invested with sanctity, precision, and prognostic significance with respect to individual children. The current trend towards misuse of these classifications for the justification of such postulates as "small but healthy" and for the promotion of nutrition policies of brinkmanship in the developing countries must be resisted.