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The Concept of Kwashiorkor from a Public Health Point of View

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It is now generally agreed that the type of severe malnutrition in infants and young children for which the name kwashiorkor is widely used is basically the same in many parts of the world—in Africa, India, and South-East Asia, the Caribbean, Mexico, Central and South America, and Europe. Underlying many differences in terminology and regional variations in the details of the clinical picture, there is a fundamental unity. The clinical, pathological, and biochemical features of the syndrome have been very fully discussed in a number of recent publications.[a-e] However, few people have had the opportunity of studying the condition at first hand in several countries.

In the summer of 1955 a conference on human protein requirements, convened at Princeton, N.J., USA, by the Food and Agriculture Organization, the World Health Organization and the Josiah Macy Jr. Foundation,

[a] Second Inter-African (CCTA) Conference on Nutrition (1954) *Malnutrition in African mothers, infants and young children. Report of the ... conference, Gambia, 1952,* London

[b] Trowell, H. C., Davies, J. N. P. & Dean, R. F. A. (1954) *Kwashiorkor,* London

[c] Autret, M. & Behar, M. (1954) *Síndrome policarencial infantil (kwashiorkor) and its prevention in Central America,* Rome (*FAO Nutritional Studies,* No. 13)

[d] Waterlow, J. C., ed. (1955) *Protein malnutrition. Proceedings of a conference in Jamaica, 1953 ...,* Cambridge (printed for FAO, Rome)

[e] Scrimshaw, N. S. et al. (1956) *Fed. Proc.,* **15**, No. 3 (in press)

brought together a number of workers familiar with kwashiorkor in different parts of the world.[f] The opportunity was taken to re-examine the problem, and to consider what measure of agreement had been reached subsequent to previous international meetings, such as those held in the Gambia in 1952 [a] and in Jamaica in 1953.[d] The data on which the accompanying table is based were supplied by participants in the conference, and other members of the conference also contributed their experience to the discussion, especially the Chairman, Dr C. G. King; Dr F. Fremont-Smith, who originally suggested the idea of this tabulation; Dr M. Autret of FAO, and Dr J. M. Bengoa of WHO. The stimulus for this paper derives from the group as a whole, but for the opinions and suggestions in the latter part only the authors are responsible.

Since kwashiorkor is now recognized as a major public health problem of nearly world-wide distribution, some approach to an agreed definition of the syndrome is of great practical importance. The object of this paper is to summarize the discussion of the characteristics of kwashiorkor that took place at Princeton, and to present some reflections arising from it.

Tabulation of clinical features. The clinical features of kwashiorkor, with the importance attached to them, or the frequency with which they are seen by different observers, are listed in the accompanying table. It should be emphasized that this table is not intended to be comprehensive. In the first place, it includes only a small proportion of the countries where kwashiorkor has been observed. There was no representative at the conference from many of the regions where the characteristics of the syndrome are well documented—for example, Mexico,[g, h] Indonesia,[i] Brazil,[j] Chile,[k] Venezuela,[l] and Curaçao,[m] to mention only a few. It was felt, however, that it would be impossible to compile a comprehensive and accurate list by combining published information with this tabulation, since in these articles there is much variation in the criteria by which the cases were selected.

The tabulation, therefore, represents the impressions formed by eight representative workers of the features of kwashiorkor as they see it in their areas. Reports of the characteristics and occurrence of kwashiorkor in each of the regions represented have been published previously, although they vary greatly in accessibility and in the amount of detail included. References may be mentioned for the Belgian Congo,[n] Central America,[c, e] South

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[f] Waterlow, J. C., ed. (1956) *Protein requirements and their fulfilment in practice. Proceedings of a conference in Princeton, N.J.*, 1955..., Cambridge (printed for FAO, Rome)

[g] Gomez, F. et al. (1954) *Acta paediat. (Uppsala)*, 43, suppl. 100, 336

[h] Gomez, F. et al. (1954) *Amer. J. Dis. Child.*, 87, 684

[i] Oomen, H. A. P. C. (1951) *Docum. neerl. indones. Morb. trop.*, 3, 49

[j] Carvalho, M. (1946) *Med. Cirurg. Farm.*, No. 122, 303

[k] Meneghello, R. J. (1949) Desnutrición en el lactante mayor (*Distrofia policarencial*), Santiago de Chile

[l] Tovar Escobar, G. & De Majo, B. L. (1955) *Docum Med. geogr. trop. (Amst.)*, 7, 116

[m] Sar, A. van der (1951) *Docum. neerl. indones. Morb. trop.*, 3, 25

[n] Demaeyer, E. M. & Vanderbroght, H. (1954) *Ann. Soc. belge Méd. trop.*, 34, 417

CLINICAL MANIFESTATIONS OF KWASHIORKOR AS SEEN BY VARIOUS OBSERVERS

Area and observer	Age when cases most frequent (years)	Growth retardation	Psychic changes (anorexia, apathy)	Oedema	Skin lesions	Hair changes	Hepato-megaly	Sub-cutaneous fat retained	Diarrhoea
Belgian Congo (E. Demaeyer)	2-5	****	***	****	***	****	***	**	***
Central America (N. S. Scrimshaw)	2-5	****	****	****	****	****	*	*	***
South India (C. Gopalan)	2-5	****	****	****	**	**	*	*	**
French West Africa (J. Senecal)	<2	****	***	****	****	****	*	*	**
Jamaica (J. C. Waterlow)	<1-5	****	****	****	**	**	***	**	***
Puerto Rico † (L. E. Holt, jr.)	2-5	****	****	****	****	****	*	*	***
South Africa (J. Hansen)	<2	****	****	****	****	***	*	**	***
Uganda (R. F. A. Dean)	<2	****	***	****	****	****	*	***	**

† Cases studied in New York

Key: **** Basic feature
*** Nearly always present
** Often associated
* Seldom associated

India,[o] French West Africa,[p] Jamaica,[q, r] Puerto Rico,[s] South Africa,[t, u] and Uganda,[b, v]

Since the discussion was concerned primarily with the clinical definition of the disease by the worker in the field, no attempt has been made to include biochemical and pathological features; these have been described in detail in many of the reports referred to above. Moreover, no mention is made of some features which have a relatively restricted geographical distribution—for instance, keratomalacia, which is very common in Indonesia,[i] but rare in Africa and the Caribbean. Lastly, no claim is made that any of these features are specific, or by themselves diagnostic of kwashiorkor. All of them can occur in other conditions.

For all eight observers, growth retardation and oedema are basic features. Psychic changes are almost universally observed; skin lesions and hair changes are only slightly less common. Hepatomegaly is not listed as a feature of the disease except in Jamaica and the Belgian Congo. The retention of subcutaneous fat and the age of onset are variable.

Not included in the table, but also of considerable interest are the approximate figures for the mortality of hospitalized cases. The figure of 7%, given by Gopalan for Coonoor, was the lowest, perhaps because his series included many cases other than classical kwashiorkor. In the Belgian Congo and Kampala, Uganda, the mortality was estimated at between 10% and 15%, for South Africa and Central America between 15% and 20% and for Dakar and Jamaica at about 20%. Since the criteria for selection of children for admission to the hospital vary, these figures are only approximate and not strictly comparable, but they do give some idea of the mortality encountered by these experienced workers.

Discussion. It is clear that there is a wide measure of agreement; the findings support the generally accepted view that the syndrome is basically the same throughout the world. However, a tabulation of this sort tends to emphasize the well-developed and typical case. The opinion was expressed, notably by Gopalan (India) and Waterlow (Jamaica), that too much reliance on it would tend to undervalue the variants, and divert attention from the borderline cases, which, from the public health point of view, are highly important because they are so numerous.

Furthermore, it is certain that in different regions there may be great differences in the incidence of some of the features reported in kwashiorkor. It is unsound to speak of countries, since within one country there may be

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[o] Gopalan, C. (1956) *J. trop. Ped.*, 1, 206

[p] Raoult, A. (1954) *Clinical aspects of kwashiorkor in French West Africa.* In : Second Inter-African (CCTA) Conference on Nutrition, *Malnutrition in African mothers, infants and young children. Report of the ... conference, Gambia, 1952*, London, p. 37

[q] Jelliffe, D. B., Bras, G. & Stuart, K. L. (1954) *W. Indian med. J.*, 3, 43

[r] Waterlow, J. C. (1948) *Fatty liver disease in infants in the British West Indies*, London (Medical Research Council, *Special Report Series*, No. 263)

[s] Cheung, M. W. et al. (1955) *J. trop. Ped.*, 1, 141

[t] Brock, J. F. & Autret, M. (1952) *Kwashiorkor in Africa*, Geneva (*World Health Organization : Monograph Series*, No. 8)

[u] Brock, J. F. et al. (1955) *Lancet*, 2, 335

[v] Dean, R. F. A. & Schwartz, R. (1953) *Brit. J. Nutr.*, 7, 131

wide variations, as for instance in the incidence of dermatosis in different parts of Brazil.[w] Presumably these variations are related to differences in local dietary patterns. It is already widely accepted that certain features, notably oedema, are basic, not only in the sense of being more common, but also because they result from what is thought to be the fundamental deficiency—that of protein. On the other hand, changes such as mucosal lesions and keratomalacia are probably caused by vitamin deficiencies which can be regarded as concomitant. Further analysis of the geographical variations of kwashiorkor, by pruning off the non-essentials, should lead us to a clearer understanding of the basic nature of the syndrome. It is important, therefore, that the differences should not be minimized.

Another factor which may cause significant differences in the clinical picture is the age of onset. It was pointed out at Princeton that statements about age incidence may easily be fallacious, since they will depend on whether the observer is dealing with hospital cases, infants in out-patient clinics, or field studies. In spite of such pitfalls, it is probable that, as the table shows, there are real differences in the age of onset in different countries. It is supposed that these result from differences in the age of weaning and in the nature of the supplementary food given to the child. The age of onset may have an important effect on the clinical picture and the pathological lesions. In Guatemala, for instance, where cases often present in the third or fourth year of life, there seems to be much more reticulum fibre proliferation in organs such as the liver and pancreas than in Jamaica, where the disease is seldom seen in children more than 2 years old.

Much, therefore, remains to be done in the analysis and evaluation of all the features of the syndrome—clinical, pathological and biochemical—and of their relationship to each other. In the meantime, the classification and definition of cases must still be based largely on empirical criteria. From the purely clinical point of view this matters little. There is seldom difficulty in diagnosing a typical case of kwashiorkor, and even if a case is not typical, the principles of treatment remain the same. The difficulty comes when it is necessary to compare and contrast reports of cases in different places, or to assess the incidence of the disease in any given region. Then the question arises: Where is the line to be drawn ? What is, and what is not, to be diagnosed as kwashiorkor ? From a public health point of view diagnostic criteria which exclude all but the classical type of case result in a gross underestimation of the magnitude of the problem of protein deficiency disease. Moreover, from the standpoint of national governments and of the international agencies—WHO, FAO, and UNICEF—the importance of the disease extends far beyond the relatively small number of cases that are treated in a hospital.

Trowell in Uganda was perhaps the first to look at the problem from this point of view.[x] He pointed out that kwashiorkor as it is seen in hospitals merges by continuous gradations into a condition characterized simply by growth failure and perhaps minor changes in the skin and hair.

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[w] Waterlow, J. C. & Vergara, A. (1956) *Protein malnutrition in Brazil*, Rome (*FAO Nutritional Studies.* No. 14)

[x] Trowell, H. C. & Muwazi, E. M. K. (1945) *Arch. Dis. Childh.*, 20, 110

He considered that almost every child in Uganda, during its early years, passed through a phase of more or less severe protein malnutrition, which he regarded as mild kwashiorkor. As other workers have become familiar with the problem of kwashiorkor they too have recognized and emphasized this basic fact. For example, Scrimshaw cited evidence that in some of the Central American countries the great majority of children go through a period of severe protein malnutrition for several years after weaning, during which their growth and maturation are drastically curtailed. In many regions the children developing the classical signs of kwashiorkor are usually those who experience some additional stress, such as that of infectious diarrhoea.

At the third meeting of the Joint FAO/WHO Expert Committee on Nutrition in 1952,[y] the term " protein malnutrition " was introduced. As has been emphasized,[d] this refers not to a clinical syndrome but to a process. This process, it is thought, is caused by the continued consumption of diets that are poor in protein foodstuffs but more nearly adequate in calories. The clinical picture of kwashiorkor is a terminal result. Protein malnutrition is therefore a wider term than kwashiorkor; it is a concept covering all degrees of deficiency of protein (and factors associated with protein) in relation to calorie intake, regardless of whether obvious clinical changes are present.

However, for the clinician and field worker the problem still remains of diagnosing protein malnutrition in its milder forms. The public health importance of kwashiorkor lies not only in the large number of children who die, usually without ever reaching the hospital; equally important, and even more numerous, are the children with some of the consequences of protein malnutrition but without all of the signs and symptoms which the diagnosis of kwashiorkor at present implies.

Recently the term " pre-kwashiorkor " has been introduced to describe the early stages of the process of protein malnutrition. Intensive work is being done at a number of centres, notably by Dean in Kampala, Senecal in Dakar, and at INCAP in Guatemala, to define the clinical, biochemical and pathological changes characterizing the state of pre-kwashiorkor. The problem is that of determining the smallest changes resulting from protein malnutrition that can be recognized as significant deviations from normal.

Although there is a wide measure of agreement on the characteristics of fully-developed kwashiorkor, it is not possible in the present state of knowledge to give a simple, clear-cut answer to the very important question: How can the clinician and field worker draw the lines between health and those manifestations of protein malnutrition identified by the terms pre-kwashiorkor and kwashiorkor ? Various suggestions can be made, but no group or body has yet proposed a workable answer. This difficulty in delineating a disease entity and defining its early stages is, of course, not a new problem; as pointed out in the discussions of the Jamaica Conference on Protein Malnutrition,[d] it has arisen for almost every disease. Yet if statistics are to have any value, and reports from different places are to be comparable, some acceptable solution must be found.

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[y] World Health Organization, Joint FAO/WHO Expert Committee on Nutrition (1953) *Wld Hlth Org. techn. Rep. Ser.*, 72

Until the time when agreement is reached on the essential diagnostic criteria, it would be of the greatest value if all such reports were to contain a frequency table of the various changes observed. It is also important that the basis on which the subjects were selected be clearly and explicitly stated—e.g., whether patients were studied in the hospital, in clinics, or in a random sample of the population. If an author does this, he is free to define the zone between health and frank kwashiorkor in terms of any combination of findings that seems to him appropriate. With a frequency table given, it will be possible for other workers to make valid comparisons with their own data, unimpeded by differences hidden in terminology. In this way comparable statistics could be obtained without the necessity of imposing uniform diagnostic criteria. At this stage, an attempt at uniformity might obscure important regional differences, and allow deviations from normal that are of public health significance to pass unrecorded.