

Ecology and Pathogenesis of protein-energy malnutrition

by Dr Mpumelelo D Bomela

Within the spectrum of protein-energy malnutrition (PEM) most investigators have recognized three clinical types of severe malnutrition: i. Kwashiorkor ii. Marasmus iii. Marasmic-Kwashiorkor.

We base the criteria for distinguishing between these three conditions on Wellcome Classification (1970). This is based on the presence or absence of oedema and the deficit in body weight.

The Wellcome Classification

Weight (% of Standard)	Oedema	
	Present	Absent
80 - 60 < 60	Kwashiorkor	Underweight
	Marasmic-Kwashiorkor	Marasmus

General clinical features of kwashiorkor

It affects older infants and young children who can fend for themselves. These children are apathetic, irritable, weak and inactive. They have oedema and fatty liver.

Weight deficit is almost always present; hair and skin changes, hepatomegaly and hypothermia are frequently but not invariably found. Serum albumin is reduced and anaemia is nearly always present. Ocular signs of vitamin A deficiency are common in certain areas.

Anorexia, intermittant diarrhoea and vomiting are frequent complaints. There is usually recent regression in motor development, and bacterial and viral infections are common.

Oedema is sine qua non for the diagnosis of kwashiorkor and may be lost within two-three days or more gradually.

Growth failure manifests in muscle wasting. There is also a height deficit

seen more frequently in marasmus than in kwashiorkor. Bone age and head circumference are also retarded. Rapid 'catch-up' of weight for height may be achieved in six-eight weeks, on a suitable diet.

Skin changes may or may not be present, and are reversible on recovery. They may be one or a combination of hyperpigmentation, hypopigmentation, ulcerations in flexures, fissures, scabies infestation. Hair changes denote chronicity.

Hepatomegaly results from fatty infiltration in the liver. The fatty liver has been implicated as the possible cause of death in Jamaica and South Africa.

Psychological changes include listless apathy, misery, easy irritability which are all constant. "A child with

kwashiorkor never smiles" (Prof Smythe). They lose appetite.

General clinical features of marasmus

Marasmus is characterised by gross wasting of the muscles and subcutaneous tissues, and marked stunting with absence of oedema.

The highest incidence is in those who cannot fend for themselves in infancy immediately after weaning. It results from prolonged and severe dietary inadequacy. Many changes take place: growth failure; a marked weight deficit as well as a deficit in height are apparent. They are grossly emaciated and look like they have had a great many worries. Psychological changes make them irritable and fretful. Their appetite increases markedly. Environmental stimulation additional to routine hospital care improves the IQ of these children but recovery is never complete. Skin and hair changes and Hepatomegaly are found less frequently.

Prognosis and mortality in severe PEM

The 20% mortality in severe PEM is due to the concomitant respiratory infections and electrolyte imbalance. Other poor prognostic features are weight deficit, hepatomegaly, depressed sensorium, hypothermia, hypoglycaemia, severe dermatosis, xerophthalmia and hyperbilirubinaemia and increased liver enzymes.

Ecology and pathogenesis of protein-energy malnutrition

PEM is an environmental disease. As the environment changes so does the nature of the malnutrition that develops. It is preventable if the following are provided: adequate and balanced feeding; economic planning and providing for the underprivileged, immunisation programs; improved water supply; marriage and fertility counselling.

Dietary role in development of kwashiorkor and marasmus

The dietary factors contributing to the development of marasmus or kwashiorkor have been changing over the past thousand years.

The protein/energy ratio as an explanation for the differential development of marasmus or kwashiorkor has been most attractive until the end of the sixties when it became clear that the differentiation on dietary grounds may be not as clearcut as was originally assumed.

An adequate breast-milk intake is very important in the maintenance of good rate of growth in infancy. Children should have an adequate breast-milk intake before they attain

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five kg of weight (\pm three months of life) and get good supplementation thereafter.

Role of metabolism in the pathogenesis of P E M

In 1968 Gopalan postulated that kwashiokor was essentially a failure of metabolic adaptation. He suggested that the biochemical mechanisms which are usually invoked to protect tissues like the liver at the expense of less essential muscle during energy deficit failed to operate in some children and thus they developed kwashiokor.

Most children with P E M have components of both marasmus and kwashiokor. The reason for this is that when a high carbohydrate diet is available, the rapid route of development of kwashiokor is followed, but during periods of food shortage, or when a child is too ill to eat, the marasmic route is adopted.

Nutrition-infection in aetiology of P E M

There is an association between Malaria infection and development of Marasmus in Gambia. (Mc Gregor, Billewicz & Thomson, 1961). Patients

with measles had a marked loss of weight and a considerable drop in serum albumin, up to 1 gram/decilitre. (Morley 1962; Murphy 1966; Poskitt 1971).

Gastroenteritis has also been linked with the appearance of kwashiokor. (McKenzie et al 1967; Morley, Bicknell & Woodland 1968). This may be related to seasonal infections. (Poskitt 1972) or may result from unhygienic and inadequate bottle-feeding following weaning.

Possible reasons why protein synthesis should be so sensitive to infection are fever leading to negative nitrogen balance and infection being accompanied by anorexia.

Social factors affecting development of P E M

Socially, beliefs and myths have played a big role in the development of protein-energy malnutrition. A few examples are enumerated below:-

Ceasing breast-feeding once a new pregnancy has started.

Breast-feeding in some instances is a relative contraceptive measure but not always. A second or subsequent pregnancy may result even before the child has come off the breast. The breast-feeding baby is then taken off the breast and is sometimes taken care of by a grandmother. Her diet is then inadequate and the trauma of maternal deprivation merely worsens the situation. The term kwashiokor from West Africa describes a child deposed by an ensuing pregnancy. (Burgess & Dean 1962)

Food taboos

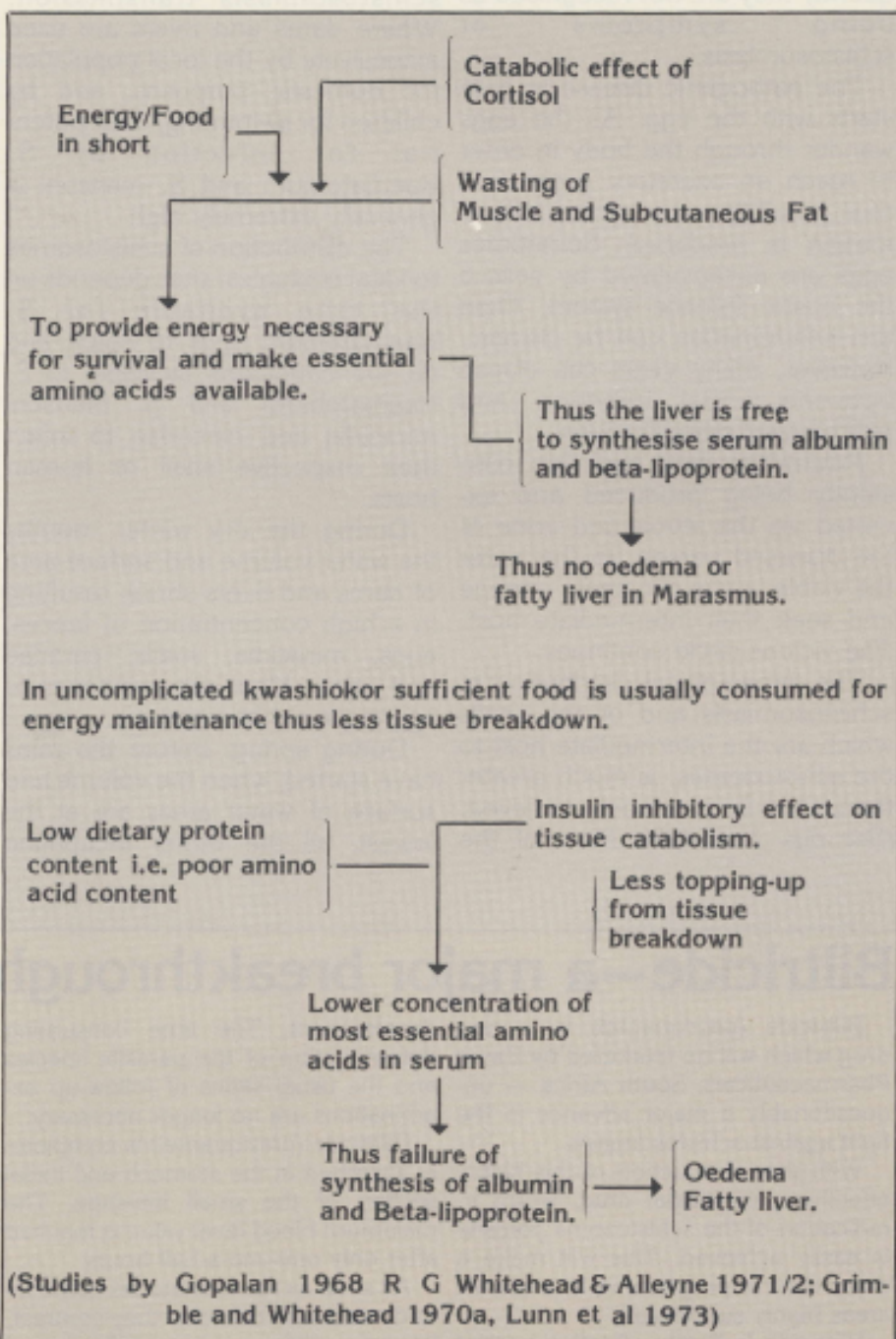
This limits the alternatives, especially in time of shortage. Some populations, for an example, do not allow girls to eat eggs because they will be infertile.

In some islands of the Eastern Caribbean people believe that children who have been on milk (human or cow's milk) have a stomach full of curdled milk, which has to be cleansed of the milk before another type of diet is commenced. This is effected by a variety of dietary restrictions, laxatives and herbal medicines.

Traditional ways of feeding

Nearer home, in the Eastern Cape, babies belonging to young mothers are fed on 'Inembe', which is derived

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from boiled maize grains. The grandmother is the one who prescribes this diet maintaining that she nurtured all her children on this diet.

Malnutrition accompanying medical conditions

In Southern Africa, mothers were and still are advised to take their children suffering from gastroenteritis off milk while supportive electrolytes and fluids are being administered.

This is detrimental to children who have a poor nutritional status because they are deprived of nutrients when their systems need them most. Secondly it gives mothers the idea that milk is bad for their children. They thus withdraw milk indefinitely. Lactose intolerance is very uncommon in this area.

Any breast condition especially infective conditions tend in the eyes of mothers, to be a contra-indication to breast-feeding. They abstain from breast-feeding, even from the healthy breast.

Anorexia is a common accompaniment of ill-health especially so in organic febrile conditions. With the

first sign of loss of appetite shown by the baby the mother takes the baby off the breast and the answer to why the baby has been weaned so early comes back very readily:

"He does not want to suckle anymore?"

Separation of child from mother

This happens most frequently in hospitals where facilities for admitting the child with the mother are lacking. The psychological trauma to the child can be so great that some degree of depression manifests in the child who is emotionally dependent on maternal love.

The same phenomenon is seen at harvest-time or planting time. Broken homes have a detrimental effect on the metabolism and especially the appetite of infants and children.

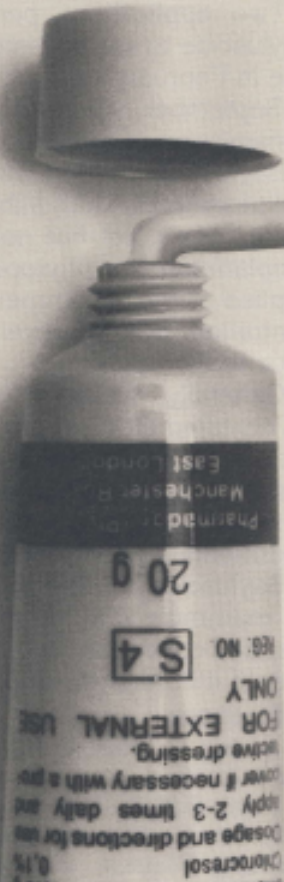
Illegitimate and unwanted children are frequently affected, so are children of biological fathers who assume little or no responsibility. Young mothers under certain circumstances have very little time set aside for their offspring.

Reference: *Alleyne, Hay, Picou, Stanfield & Whitehead 1979.*



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