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The main causes of death in malnutrition

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The great killers in the developing countries are the classical contagious diseases and diarrhoea. The high incidence of these diseases is mainly due to the enormously increased exposure to infectious agents in a milieu of incredibly low hygienic standards. Malnutrition on the other hand, is responsible for the long duration and the often malignant course of these diseases. Undermined immunity in malnutrition may lead to septicaemia. Diarrhoea, besides the danger of hyponatraemia, hypokalaemia, acceleration of the wasting process may lead to hypovolaemic shock. Other types of circulatory disturbance are caused by very low serum albumin values, by the overloading of the wasted heart by fluid, by hight salt or calorie intake. Further dangers are hypoglycaemia and hypothermia.

The briefly summarized dangers can rather exceptionally also be encountered in the advanced countries. Malnutrition in these parts of the world is brought about by organic diseases, by intractable diarrhoea or by psychologic disturbances.

In many rural areas of the developing countries one-fourth or even more of all children die before they are five years old [12]. The great killers, causing about five million deaths per year, are six contagious diseases of childhood: measles, diphtheria, tetanus, poliomyelitis, tuberculosis, pertussis [5]. Diarrhoea also accounts for about five million deaths per year. The high incidence of these diseases is mainly due to the enormously increased exposure to infectious agents in a milieu of lowest hygienic and socio-economic standards, as well to the low vaccination coverage.

The high incidence of malnutrition is responsible for the long duration and the often malignant course of these diseases. In malnutrition, cell-mediated immunity is undermined by "nutritional thymectomy" [16] i. e. by depressed thymic hormone activity. The number of T-lymphocytes is decreased, the bactericidal capacity of the leukocytes is lost and complement activity is also low. Young malnourished patients, who were low-birthweight infants and thus born with a low T-lymphocyte count, succumb particularly to infection. Undermined immunity in malnutriton leads to septicaemia in the case of E. coli infections [11].

A further dangerous consequence of infection and of diarrhoea is the

Dedicated to the memory of Professor J. Bókay Jr and to the 100th anniversary of his children's hospital

acceleration of wasting of somatic proteins leading to severest malnutrition accompanied by all the dangers of this condition. The latter is summarized in the following Tables.

Some unfavourable prognostic factors in marasmic, non-oedematous malnutrition are the same as in kwashiorkor-like malnutrition: young age, low weight for height, hypothermia, hypoglycaemia. Some changes, carrying a bad prognosis, as liver involvement, high bilirubin and low serum albumin values are, however, absent.

The high mortality-rate in diarrhoea is partly due to its well-known metabolic changes: hypo- and hypernatraemia, hypokalaemia, acidosis, acceleration of the wasting process of protoplasmic tissues and to anoxic circulatory disturbances brought about by dehydration.

A hypovolaemic circulatory shock may develop besides dehydration also with extremely low serum albumin values as shown in Table I. Death due to the overburdening of the wasted heart by overzealous administration of fluid, very high salt intake, fast rise in energy intake or simply by infection is not an infrequent cause of death in both forms of undernutrition.

TABLE I

Factors worsening the prognosis in the oedematous or hypoproteinaemic forms of malnutrition

Factor	Death per cent	Reference
Enlarged liver	24	7
Gross oedema	20	7
Bilirubin > 1.0 mg/dl	32	7
Sodium < 120 mmol/l	46	7
Protein < 4.0 g/dl	34	7
Haemoglobin 66.0 g/l	28	7
None of these factors	3.8	7
Hypothermia	35	2
No hypothermia	9	2
Hypoglycaemia (manifest)		9
	89	3
		18
Mean blood glucose		10
89–51 mg/dl	0	18
		15
Serum albumin 4.0–8.0 g/l	62.5	8
Serum albumin 15.0–20 g/l	3.5	8

TABLE II

Some prognostic factors in marasmus (W/tage in the whole material 70–40% [11])

Age months	Weight/height per cent	Death
	Effect of age amd wt/height	
Under 6	60–70	55.0
	80–90	15.0
6–12	60–70	20.0
	80–80	2.0
	Effect of age in diarrhoea	
1–2	—	33.0
6–12	—	0.0
	Effect of hypoglycaemia	
	Blood glucose, mg/dl	
3.2	68	16.6
3.3	34	26.6
2.7	11	52.1

The briefly summarized dangers brought about by undernutrition may also be encountered of course rather exceptionally in the advanced countries. In the poor and less educated stratum of population as some gipsies [10] or in the USA in Navajo-Indian [6] kwashiorkor may occur. Hypoproteinaemic malnutrition was found in seven among 130 infants in mucoviscidosis [13]. A further cause may be peculiar cult diets [14] or simply dietary prescriptions. Malnutrition was common in beleaguered cities as described after the siege of Budapest [17]. Our observations summarized in Table II were also made during the postwar misery in Hungary. Marasmic malnutrition was described by numerous authors in cases of intractable diarrhoea of young infants [1].

Prognosis is worst in the familial forms of diarrhoea; they may be associated with a mortality rate of 87.5% in severely malnourished cases [4].

These briefly summarized facts show that the things to be done to decrease the high mortality rate in the conditions described are, besides the prevention of infections and diarrhoea, early recognition, prevention and treatment of malnutrition.

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