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Malnutrition☆

Desnutrición

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The following article was first published in 1946 in the *Boletín Médico del Hospital Infantil de México* (Bol Med Hosp Infant Mex. 1946;3(4):543-551). The present issue is reproduced as a tribute to the seventieth anniversary of this work, which was a milestone in the history of research on pediatric malnutrition and whose contributions have remained current throughout the world since 1950 to date.

1. Malnutrition

The poor assimilation of food by the organism leads to a pathological state with different degrees of severity and different clinical manifestations, which is called *malnutrition*.

The term malnutrition, already definitively adopted in the terminology of our hospital, came to simplify, extraordinarily, the confusion and variety of names that existed in the different Pediatrics schools and that were used to denominate similar ailments: clinical entities called hypotrepsy, hypotrophy, dystrophy, atrepsy, Parrott's atrophy, decomposition, wasting, and many others, are simply different degrees of the same disease of varied etiology, which we now generically refer to as malnutrition.

The word malnutrition points out to any abnormal loss of weight of the organism, from the slightest to the most severe, without any preconception regarding the state of the illness, as it can equally classify a child who has lost 15% of its weight with malnutrition, as a child who has lost 60% or more, by adjusting these data to the weight that corresponds to a given age, according to known constants.

Malnutrition may be an initially isolated disorder, with all the varying symptomatic courtship of its various degrees, or it may appear secondarily, as a syndrome grafted along infectious or other conditions, and then its symptoms and manifestations are more localized and precise.

The classification of the different degrees of malnutrition has been the object of distinct and sometimes confusing and not connotative terminology; we followed the simplistic terminology that we started at the hospital, which indicates quite clearly the state that a child with malnutrition has in its different stages.

We denominate first-degree malnutrition to any weight loss that does not exceed 25% of the weight that the patient should have for his or her age; second-degree malnutrition refers to a weight loss fluctuating between 25-40%; and finally, third-degree malnutrition refers to any weight loss that exceeds 40%.

2. Causes leading to malnutrition

It can be stated that 90% of the malnutrition in our environment is caused by a single and main cause: underfeeding of the subject, due to a deficiency in either quality or quantity of the foods consumed. In turn, underfeeding is determined by several factors: poor, miserable or unsanitary diets, or

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absurd and crazy diets with a lack of technique for feeding the child.

The remaining 10% of malnutrition is caused by enteral or parenteral infections, congenital defects in children, premature birth, and in the congenitally weak; lastly, prolonged stays at hospitals or closed institutions as the origin, which is referred to as hospitalism.

Hospitalism is an undetermined and mysterious pathological entity that profoundly alters the normal assimilation of food, which strikes children who have been hospitalized for a long time, even though they are surrounded by all hygienic and medical attentions, and despite the diet to which they are subjected to that is correct from all considered points of view.

It is a sort of deep reduction of the faculty to react that a child's organism normally possesses both defensive and assimilative, which affects the normal physiology of the digestive system and, in turn, has profound repercussions on all processes of anabolism.

At the time of Archbishop Lorenzana, in 1780, the friars that attended the Casa de Cuna (orphanage) wrote in their books that ''the children died of sadness''; they found no illness in them, they just did not progress, did not want to eat, became sad and then died.

Many years later, it has been verified [Rev. Mex. de Puericultura. Volume III. Page 245] how malnutrition was installed in the children at the orphanage despite all the medical and dietary techniques surrounding them. In order to save them, only one measure was available: to move them from the closed institution to their own or to a substitute home.

It has been proven the child under two years of age is who resents the most from the defense system, reactions and food assimilation after four or more months of hospitalization.

Underfeeding, the main cause of malnutrition, has multiple origins. However, in our environment, poverty, ignorance, and hunger, are the causes contending for primacy in the pathogenesis of underfeeding, which leads to malnutrition.

Usually, the breastfed child, even while living with a mother in a precarious situation of hygiene and abandonment, progresses satisfactorily until six or seven months of age; after this time, the tragedy begins, slowly but surely, causing stagnation or loss of weight leading the child towards malnutrition. The infant keeps growing and aging, and the mother, on the contrary, enters the negative phase of lactation, and the ability to satisfy the child's nutritional needs only by breastfeeding is reduced every day. Ignorance prevents her from knowing with what else she can feed her child or poverty prohibits her from acquiring what she knows her child can eat; the infant is barely sustained with the remains of breast milk that a badly fed woman, who is already in the period of physiological hypogalactia, can provide. First, there is weight stagnation; then, a disparity between weight and age ensues, and subsequently, the disparity between the three factors, weight, age and height, which normally follow parallel upward curves. In malnutrition, the only curve that remains normal is that of age, diverging extraordinarily from the others.

When the child reaches one year of age, he barely preserves the weight he had at six months of age; a few months previously or at that time, weaning and mixed feeding have already begun, sometimes nonsensical or miserable due to its meager quantity and quality. In any case, the physiology of the assimilation systems keeps deteriorating and the deceleration of the weight curve keeps accentuating. Infections are easily implanted on this weakened environment, affecting whether the enteral tracts or localizing to the most susceptible parenteral sites, which complicate the scenario with periodic diarrhea that progressively exhausts the meager reserves left in the organism.

In this slope of malnutrition, the child rolls with greater or lesser speed, going from mild to moderate and to the more severe malnutrition in an insensitive and progressive way if the expert intervention of the physician is not timely to stop this fall.

3. Clinical manifestations

3.1. First-degree malnutrition

The child becomes chronically weepy and discontented, in contrast to the happiness, good humor and adequate sleep he previously had; this stage goes often unnoticed by mothers, unless they are keen observers. Weight loss is not appreciated. However, when comparing his current weight with his previous (four or six weeks ago) weight, stagnation can be noted. During this period, diarrhea is not present; on the contrary, a mild constipation ensues. No vomits or other gastrointestinal manifestations are present. Infections do not affect the child, who still conserves his reactive and defensive capacities nearly intact, as it generally occurs at the beginning of the illness. Therefore, the main sign, which can be observed only if it is searched for, is the stagnation or a slight weight loss that persists: the child ages and weight falls behind, decelerates or stagnates.

3.2. Second-degree malnutrition

Imperceptibly, weight loss is accentuated, and ranges from 10-25% to larger losses; the fontanelle sinks, as well as the eyes, and the tissues of the body become loose, without turgidity and elasticity. The child sleeps with half-opened eyes and is prone to colds and otitis. His irritability is accentuated; diarrheal disorders are easily found, and sometimes, even from this degree of malnutrition, discrete manifestations of B factor deficiency, as well as edema caused by hypoproteinemia can be observed.

The end of the second stage of malnutrition is frankly alarming and the parents are driven to go to the doctor if they had not done so before.

If the physician is impressed by the acute enteral event, or by the pharyngitis or otitis, and does not carefully evaluate the diet of his patient to estimate its quality and energetic efficiency, this vital line of guidance is missed, and if he prescribes ''to treat the infection'', the child would have taken another step in the fatal slope of malnutrition.

Consequently, if the administered dietary and therapeutic measures are not sufficiently careful and effective, the patient falls into an exquisite intolerance to all kinds of foods and to all quantities given. This intolerance obliges

to make frequent changes on the diet, and leads to new digestive assimilation attempts on behalf of the organism, during which time is lost, the consumption of the reserves keeps increasing, and the weight curve deceleration and moves further away from the normal parallelism with the age curve.

3.3. Third-degree malnutrition

Third-degree malnutrition is characterized by the exacerbation of all the symptoms that have been described in the previous stages, and the child progresses to this point, whether because there was not an expert intervention to guide the organic restitution, or because the poverty and ignorance fulfilled their homicidal role, or because, despite the implemented measures, the cell and its metabolic mechanisms had entered a negative or anabolic imbalance phase, which does not allow harnessing even the minimum quantities to sustain the patient's limited activity.

The eyes sink, the face of the child becomes small and acquires an ''old person'' aspect; prominence of the bony structures of the face can be seen and the Bichat's fat pad becomes grotesquely notable as the last adipose reserve of this sector of the organism.

Limb muscles hang as heavy drapes lined with dry and wrinkled skin; the bones of the upper extremities, the back and the thorax are lined with a flaky, wrinkled skin that has no vitality or elasticity. The eyes of the child are still alive, bright, and follow the movements that surround him with great avidity, as if they were anxiously searching the food that could serve as salvation.

Many malnourished children reach this stage without having edema caused by protein deficiency, or any signs of vitamin deficiency. In contrast, other children can have swelling of the legs, of the back of the hands and eyelids, and over these areas of edema, hyperchromic, achromic and dyschromic pellagra-like manifestations can be observed, which give the known mosaic of shapes and colors, known by the name of ''*culebrilla*'' in Yucatan.

Overlapping the distressing state of wasting, a complete intolerance to food—which sometimes is taken voraciously—, easy vomiting, digestive events with an acute or semi-acute onset, and focal infections that burst with a maddening periodicity and progressively increasing virulence can be observed as predominant features.

The patient's body is in a complete organic bankrupt; cells only retain the capacity to transform the amino acids that they extract from the meager protein reserves left in the muscles in food for consumption. There is no food available that can be used, no matter how simple, pure or appropriate it might be, and sometimes it is not even tolerated. This is the stage of negative balance in every system in the organism, which are linked, well-adjusted and complement each other for assimilation in a normal state.

Catabolism increases its curve disproportionately, and its dragging and scrapping function acquires catastrophic and destructive properties, carrying away everything that is usable and left from the disaster of protein molecules, glycogenic and adipose stockpile. Mineral salts and water also have their gates open, and it is not strange that acute anhydremia ensues with even the slightest diarrheic event.

The end of these clinical scenarios is generally accelerated by acute digestive events or by enteral or parenteral infections, which present with the most diverse final symptomatology.

4. Malnutrition prophylaxis

Two aspects of equal importance in the prevention of malnutrition must be considered:

1°. Family factor
2°. Medical factor

4.1. Family factor

It is obvious that malnutrition could be avoided in a significant percentage by fixing poverty, but it is not within our reach as physicians to point out measures of nationwide scope to improve the standard of living of the people. However, family ignorance is still left and should be addressed intensely with all the available means. The physician must turn into an educator of his patients and a spreader of the most fundamental concepts of childcare for the parents to learn to distinguish the healthy from the sick child, and attend to the clinic or hospital in a timely manner.

The great value of weekly weighing children under two years of age to be aware of the danger of not gaining weight for several weeks or even losing weight, and to fear episodes of vomit and diarrhea must be taught to the parents. Prophylaxis of malnutrition should be the joint work of physicians and nurses, social workers, official departments, private institutions, and every social element that has contact with the mother and the child in a given country.

4.2. Medical factor

It is essential that the physician knows the energetic value of food and how to integrate a correct formula for feeding; he also must know the caloric intake need of an organism, to be able to dictate dietary measures to prevent malnutrition.

The physician that has the knowledge to recognize the immense value that the weight curve has during the first year of life can prevent malnutrition in children under his care or treat it in a timely manner.

In children, frequent changes of milk lead to digestive maladaptation and disruption of the functions of the gastrointestinal system that can lead to malnutrition.

The physician must have patience to achieve digestive adaptation to new formulas and to advice patience also to the mother, instead of entering the tortuous path of changing one milk after another, because they ''do not agree'' with the child or because other physicians have not used them.

Once the energetic efficiency of a diet has been verified, and once its digestibility, purity, and preparation technique has also been verified, an error could be commonly made if before changing it one does not wait a reasonable time of digestive adaptation.

Some states of malnutrition can be prevented by treating infections in a timely manner and by balancing congenital defects.

Although the capacity to digest is logically diminished during infections, one must not sin of administering meager diets, since the organism is led to a dangerous state of malnutrition (diets in typhoid fever or in several infections by salmonelas and shigelas).

Prolonged infection leads to malnutrition, and prolonged malnutrition, in turn, exposes the organism to easy invasion of infections.

The knowledge of this dangerous cycle will alert the physician to prevent malnutrition.

5. Treatment

5.1. First-grade malnutrition

If the physician has made a correct etiological diagnosis by carefully valorizing the feeding history even in its most trivial details, treatment of first-grade malnutrition is simple and fast, unless it is due to incontrollable infections or congenital defects that are impossible to solve.

If the cause is underfeeding, as it occurs in 90% of the cases, supplementing the energetic needs of the patient with an appropriate diet for his age and background is sufficient for the child to regain his weight and return to having good sleep and to his general happy disposition.

No drug, vitamin, or tonic are necessary. Only sufficient and digestible food, and it will be a resounding succes.

It can be said that 100% of patients will be saved if treated properly and receive medical care in a timely manner.

5.2. Second-degree malnutrition

Two principles must guide the treatment in these cases:

1st. Administering food of great energetic value in the lowest volume of formula, to be able to administer 250-300 or more calories per kilogram per day, without causing vomiting.

2nd. Fight infections tenaciously; drain the ears if they are sick, remove adenoids, monitor the kidney, skin, among others.

There are other series of measures that complete the task: vitamin B complex, normal saline given by hypodermoclysis at 25 c.c. per day; stimulating the activity of the skin with general ointments of alcohol at 50%, ensure sufficient liquid intake, impose a certain level of physical activity to treat asthenia and indifference; small transfusions of blood (10 c.c. per kilogram) administered every five days.

Success is obtained in 60-70% of the cases if there are no infections that take over the organism and prevent all possibilities of restoration.

5.3. Third-degree malnutrition

Most treatments and medications fail when facing a third-degree malnutrition; when the child has lost more than 50% of the weight for his age, the fight is desperate, costly and almost always useless. Particularly when dealing with malnutrition that has been progressing slowly, totally consuming the reserves and exhausting the reactive and defensive faculty of the organism.

The prognosis is less dismal when a violent malnutrition caused by typhoid fever, or by acetonemic vomiting or some disorder which provokes malnutrition in a short time ensues. In these cases, the favorable reaction of the organism, its lively defenses and the strong combustion of convalescence puts the child safe in a few days.

Third-degree malnutrition requires a great discretion for refeeding, seeking that the digestive system reestablishes its functional capacity to digest, which is lost in many cases.

Food in small volumes, with no fat, and of great energetic value at the expense of carbohydrates and proteins are the ones of choice.

Semi-skimmed milk with 10% of Dextro-Malto or corn syrup is the food with which we initiate refeeding at our hospital; at the same time, if the child is older than one year, we add bread to induce chewing and salivation, as well as ripe banana.

Every acute symptom must be addressed with tenacity: anhydremia, enteric infection, parenteral infection, skin infections.

Daily transfusions are administered: 15-20 c.c. per kg of weight, always preceded by the same or twice the amount of normal saline or 5% glucose serum.

Hemoconcentration in third-degree malnutrition must always be avoided, but as it is an almost inseparable condition and the patient needs total blood, serum is injected first and then the total blood: some patients react in the first six or eight transfusions. Others have needed 20 or 26. Despite this amount of blood, many patients cannot assimilate some of the food they are given nor gain weight.

Vitamin B complex, vitamin C and vitamin A are added if any signs of deficiency of these factors are found.

Finkelstein's inverse or paradoxical reactions are frequent: as more food is given, especially protein, the weight decelerates even more with the increase in the formula instead of improving. These inverse reactions may be due to the hepatic barrier, which cannot carry out its normal function on proteins. These inverse reactions have been prevented by administering amino acids intravenously (Amigen, Mead), in a proportion of 3-4 g/kg in a daily basis.

Amigen is a protein hydrolysate that does not require any specific enzyme for its use by the cell, so it bypasses the enzymatic deficiency of the stomach and intestine, the profoundly deranged function of the liver and goes directly to the cell. Amigen has been of great help when total blood is not enough.

Digestive capacity, revealed by an increased appetite, greater activity, better looking depositions, ceasing of weight loss, demands constant and careful increases in the diet: egg, meat juice, soups, until an age-accordant diet is achieved.

It should be kept in mind that, despite an adequate guiding of a dietary and therapeutic treatment and observing favorable patient responses, the patient requires a period of restitution that varies from 5 to 6 weeks, during which the patient does not gain any weight; if anything, it remains without further loses.

Dietary changes must not be made to try to accelerate healing, which carries the painful consequence of failure; patience, discretion and slow steps are indispensable attributes in the treatment of third-degree malnutrition.

Third-degree malnutrition is essentially a disorder that can be treated with some probability of success only in a well-equipped and experienced hospital.

It requires from three to five months of constant care. It is extremely expensive to treat a patient of this kind since most of the time people with poor economic resources and scarce cultural background are the ones affected by this ailment.

Estimations made at the Children's Hospital teach us that with the efforts, the money and the elements used to save a child with a third-degree malnutrition, malnutrition could be prevented in one-hundred healthy children or cured in seventy-five children with first-degree malnutrition. Government or private institutions measures concerning the mother and the child must be predominantly preventive for malnutrition.

6. Conclusions

1st. A new terminology is proposed to substitute the words hypotrepsy, atrophy, decomposition, atrepsy, hypertrophy, dystrophy, etcetera, considering them as different grades of the same disorder that affects the whole organism and that is simply called malnutrition.

2nd. The new terminology is guided by a greater or lesser weight loss suffered by the organism, without the preconception of any etiologic or pathogenic factors.

3rd. Weight loss that does not exceed 15% of normal weight for the patient's age will be called first-degree malnutrition. Weight loss that ranges from 15% to 40% will be called second-degree malnutrition; and finally, third-degree malnutrition will refer to a weight loss that exceeds 40% of the weight that the child should have.