

# **CHRONIC DIGESTIVE DISORDERS**

## **Malnutrition**

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# **Dystrophy – chronic digestive disorder**

**is characterized by impaired absorption of nutrients the body tissues due to the breakdown of the processes of digestion and assimilation of nutrients in the gastrointestinal tract,**

**-or quantitative / qualitative deficiencies in breastfed children.**

**- Non-specific reaction of the body to adverse effects, leading to abnormal distribution of subcutaneous fat layer (↑ or ↓), changes in tissue turgor, skin color, muscle tone, decreased resistance to infections.**

# Definitions

*Hypotrophy / malnutrition /protein-energetic failure* - is a chronic digestive disorder characterized by weight deficiency depending on height (English literature – malnutrition).

## Epidemiology

No accurate data.

1-2% of children in Russia with severe malnutrition,

10-20% in countries with poor socio-economic conditions

**Social disease!**

## Deficient state - definition

A group of diseases which are due to either

- insufficient intake of food,
- or excessive loss
- or low utilization of some food ingredients (water, protein, fat, carbohydrates, vitamins, minerals).

The highest incidence of deficiency states accounted for most periods of active intensive growth of the body (infancy, pre-preschool, preschool and adolescence).

# Deficient state – etiology/pathogenesis

**Low stocks at birth with high demand due to the intense growth** (premature babies, congenital development retardation, chronic diseases in mothers etc.) at lower possibilities of utilization of certain substances

- **Insufficient intake of certain substances due to the one-sided feeding, family traditions in the diet, and others.**
- **Digestive disorders (splitting, absorption and utilization of nutrients) due to primary or secondary malabsorption syndromes, maldigestion, dysbiosis etc.**
- **Eating disorders developing in a bottle-fed child, which lead to the development of anemia, frequent infectious and somatic diseases.**

# Deficient state – clinical signs

## Trophical disturbances

- Retardation in the physical and psycho-motor development of the child
- Development of iron deficiency anemia and other deficient state
  - Increased frequency of hypovitaminosis (rickets, vitamin deficiencies B1, B2, etc..)
- High frequency of infections (acute respiratory and gastro-intestinal tract infections etc.), disorders of the gastrointestinal tract.
- A combination of several deficiencies

**Conclusion - common principles of therapy  
replacement therapy with the missing ingredients**

**Most often in pediatrics from deficiency states occur -  
rickets, malnutrition, Fe- deficiency anemia,  
hypovitaminosis.**

**There are 3 types of dystrophy–**

- 1. Malnutrition**
- 2. Small stature**
- 3. Paratrophy - chronic digestive disorder under  
-normal length and body weight  
-or weight exceeds over length  
-or exceeded both of them (10%) above the age norm .**

**Obesity – body weight exceeds the norm by 25%**

# Classification

Type of dystrophy	Grade of severity	Periods	Due to	Exogenous causes	Endogenous causes
<p><b>1.Hypotrophy</b> (delaying in weight gain according to height)</p> <p><b>2.Paratrophy:</b></p> <p>1. With body weight excess on height</p> <p>2. With uniformly over-weight and over-growth</p> <p>3. With normal body weight and growth <u>but with signs of dystrophy</u></p>	I, II, III	<p>Initial</p> <p>Progressive</p> <p>Stabilization</p> <p>Recovery</p>	<p>1. Pre-natal</p> <p>2. Post-natal</p> <p>3. Prenatal-postnatal</p>	<ul style="list-style-type: none"> <li>• Alimentary (protein-energy deficiency)</li> <li>• Infectious</li> <li>• Toxic</li> </ul>	<ul style="list-style-type: none"> <li>• Anomalies of the constitution,</li> <li>• malformations of the internal organs,</li> <li>• chromosomal diseases.</li> <li>• Hereditary metabolic diseases:</li> <li>• neuroendocrine and immune deficiency diseases</li> </ul>
				Combined (exo- and endogenous)	

**Hypotrophy (malnutrition, protein-energy deficiency)** - a chronic digestive disorder, accompanied by a disturbance of the trophic function of the body, metabolism, impaired functions of the various organs and systems with physical and psychomotor development.

There are 2 types - congenital (prenatal) and acquired (postnatal) wasting.

ICD-10: term prenatal malnutrition replaced by IUGR (intrauterine growth retardation).

## **Etiology and pathogenesis.**

**Prenatal (congenital) malnutrition due to the influence of adverse factors which disturb the proper development of the fetus.**

### **Causes**

- food deficiency during pregnancy,**
- unfavorable obstetric history (multiple pregnancy, gestosis)**
- administration for pregnant woman medications: antimetabolites, anticonvulsants.**
- genetic disorders,**
- somatic diseases in pregnant (diabetes mellitus, congenital and acquired heart diseases with heart failure, kidney disease and others.)**
- unfavorable environmental conditions, etc.**

## **Etiology and pathogenesis.**

**Initial part of the pathogenesis - disturbances of utero-placental blood flow, resulting in poor transport of nutrients and oxygen to the fetus, leading to insufficient supply of fetus with plastic and energetic materials.**

**The essence of malnutrition is starvation, which is resulted in changing of the central nervous system and internal organs.**

## 3 main factors in genesis of post-natal hypotrophy :

- *alimentary* (quantitative or qualitative starvation, defects in the organization of child nutrition)
- *infectious* (frequent ART infections, pneumonia, gastro-intestinal tract infections etc.)
- *constitutional* (immunodeficiencies, enzymopathy, congenital heart disease, congenital anomalies of gastrointestinal tract, nervous system, perinatal encephalopathy, etc..).

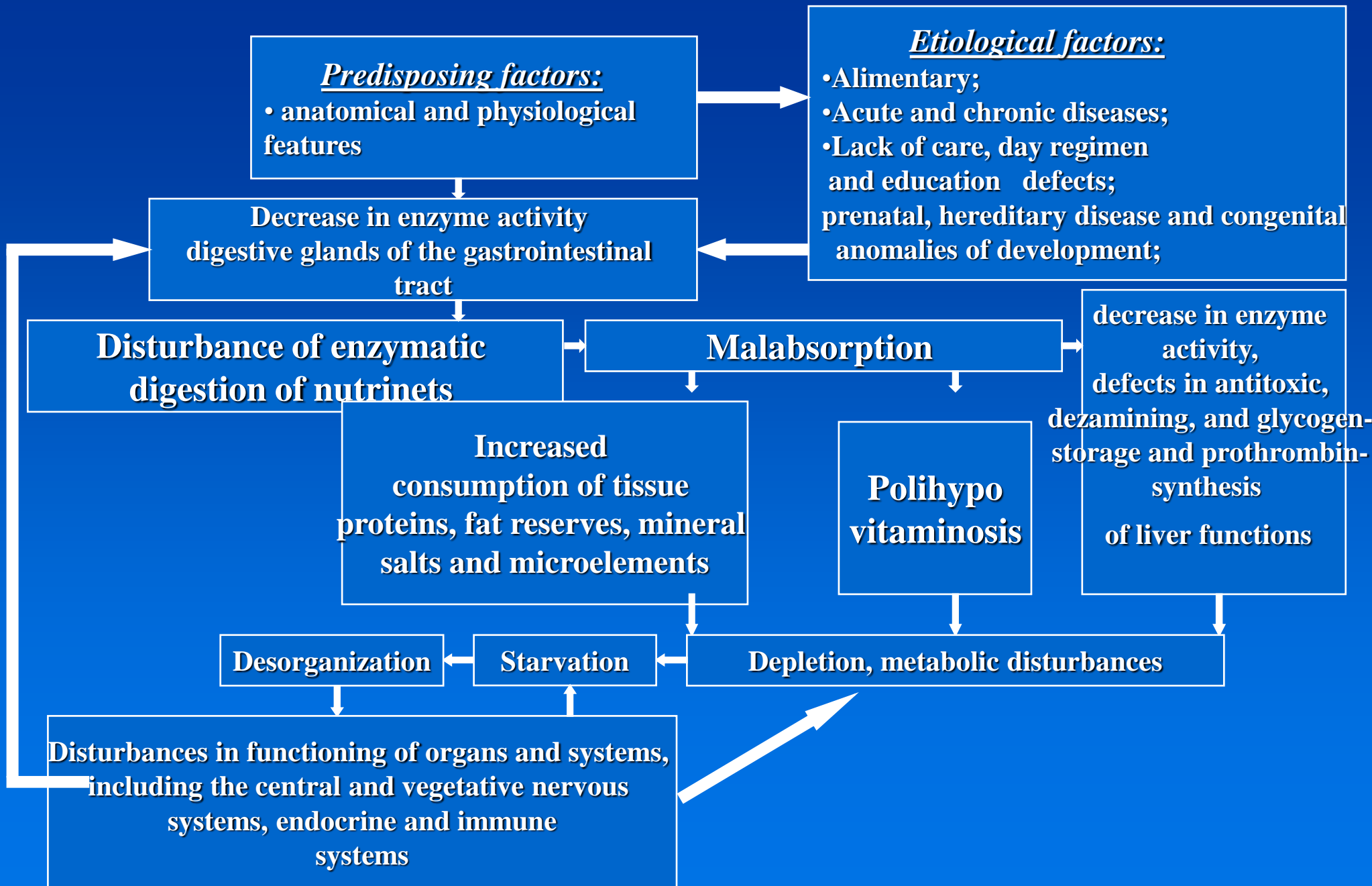
Malnutrition often develops in children with a combination of several factors.

# Pathogenesis

- Predisposing and etiological factors - **starvation** – leads to the
- using of nutrient reserves (glycogen, fat, vitamins, minerals) and structural components of the body
  - decreasing of enzyme activity gastrointestinal tract and blood serum.

Impairment of reparation of gastrointestinal epithelium leads to secondary maldigestion, malabsorption and disturbances of transport across the intestinal wall, secondary immunodeficiency, disorders of metabolism and deposition of substances in the liver, the perversion of metabolic dysfunction of all organs and systems.

# Scheme of pathogenesis of dystrophy



## **Clinical signs of prenatal malnutrition / IUGR**

**depends on the severity.**

**Ist grade of severity – body weight and length are within 25-10th centile, a moderate decreased of tissue turgor, pale skin, increased neuro-reflex irritability.**

**IInd grade - body weight and length are within 10-4th centile, marked trophic disorders - significantly reduced tissue turgor, flabby folds of skin on the legs and neck, muscular hypotonia and hyporeflexia.**

**IIIrd grade of severity - body weight and length are within 3d centiles and less, more pronounced trophic disorders, severe muscle hypotonia and hyporeflexia.**

# **Clinical signs of postnatal malnutrition also depends on severity:**

**There are 3 degrees of severity, depending on the depth of the depletion of the depot (stocks) and severity of functional disorders of the organs and systems, the state of immunity and signs of polyhypovitaminosis.**

## Clinical signs

### *1<sup>st</sup> Grade of severity*

- Weight is reduced then normal by 11-20%
- body length is between the 25th - 10th cents (P) - P25-P10 (centile tables), usually normal
- Pale skin,
- subcutaneous fat layer is thinned in all parts of the body and especially on the abdomen,
- decreased tissue turgor.
- The curve of increase in body weight **is flattened**



## **2nd grade of severity**

- **body weight is reduced by 21-30% compared to normal,**
- **there is growth retardation, body length is P10 - P3**
- **The skin is pale, dry, easy-going in the folds**
- **flabby longitudinal folds and signs of hypovitaminosis**
- **Reduced tissue turgor.**
- **Fat layer is present on the abdomen, chest, dramatically thinned on the limbs, but stored on the face.**

## Clinical signs - 2<sup>nd</sup> degree of severity

- **Significantly reduced muscle mass and decreased their tone, which leads to an increase in belly size, intestinal flatulence.**
- **weakness and irritability, anxious face and adult expression of the face.**
- **Hypochromic anemia develops.**
- **Due to decreased immunity many children have infections: otitis, pyelonephritis, pneumonia etc, often occurring without symptoms.**
- **Stool is unstable, often a mealy, protein or a “hungry stool”**

## **Clinical signs - 3d degree of severity**

- **General condition is serious.**
- **Weight deficiency - more than 30%, growth below P3.**
- **The weight curve (gain) is directed downward and has no tendency to rise. Growth stops.**
- **Indifference of a child to others, sometimes anxiety. Soundless voice, hoarse.**
- **The skin is pale, dry, wrinkled, often with small hemorrhages. Mucous dry, bright red**
- **Subcutaneous fat layer absent everywhere even on the face. Impaired temperature homeostasis.**

# *Clinical signs*



# *Clinical signs*



<b>Clinical sign</b>	<b>Grade</b>	<b>Grade</b>	<b>Grade</b>
	<b>I</b>	<b>II</b>	<b>III</b>
<b>Central nervous system</b>	<b>Irritation is replaced by inhibition</b>	<b>inhibition</b>	<b>signif. inhibition</b>
<b>Appetite</b>	↑	↓	<b>Anorexia</b>
<b>Secrets of digestive ferments</b>	↓	↓↓	↓↓↓
<b>Skin</b>	<b>pale</b>	<b>Pale, dry, reduced elasticity</b>	<b>Hanging folds, loose</b>
<b>Subcutaneous fat layer</b>	<b>On the belly - absent</b>	<b>On the belly and extremities - absent</b>	<b>Absent everywhere, incl. face</b>
<b>Tissue turgor</b>	<b>reduces</b>	<b>Signif. reduced</b>	<b>absent</b>
<b>Body mass deficiency</b>	<b>11-20%</b>	<b>21-30%</b>	<b>More than 30%</b>
<b>Body mass increasing</b>	↓	↓↓	↓↓↓
<b>Immunity</b>	<b>No changes</b>	↓	↓↓

## **Definition – *Kwashiorkor***

- **severe form of protein-energy malnutrition, which is typical for developing countries**
- **it's the significant cause of death among children in several countries.**
- **develops due to nutritional deficiency of the protein with an excess of carbohydrates in the diet of the child**

## *Kwashiorkor*

### Clinical picture

The disease is characterized by **Jelif's tetralogy** :

#### **1 – edema**

protein-free edema appear first on the feet, legs, and then cavities, swelling of internal organs

#### **2 – physical development retardation**

delayed physical development, body weight deficiency more than 30%

#### **3 - muscle wasting**

#### **4 - change of mentality**

Violations of psychomotor development, tearfulness, lethargy, apathy





## Definition

**Marasmus** (cachexia, excessive weight loss) occurs due to lack of intake of all food ingredients

### Clinical manifestations

- body weight reduction more than 60%
- growth retardation
- atrophy of muscles, subcutaneous fat
- Sick child looks extremely emaciated, with thin limbs and disproportional large head, wrinkled face of a triangular shape.
- polyglandular failure results in immunodeficiency states

## **Criteria of severity of malnutrition**

- 1. In primary malnutrition is the degree of depletion, presence and severity of purulent infection.**
- 2. In secondary malnutrition criteria of severity is the nature of the underlying disease causing wasting and degree of malnutrition.**

# **Complications of malnutrition**

**development of secondary immunodeficiency with frequent respiratory infections, purulent-inflammatory diseases, gastrointestinal disorders, hypo-vitaminosis and microelements**

## **Prognosis / outcome**

- 1. In primary malnutrition 1-2 grade – favorable**
  - 2. at 3 grade - relatively favorable.**
- 3. In secondary forms of malnutrition depends on the underlying disease.**

## **Diagnosis of malnutrition**

**based mainly on the history and clinical picture.**

**Routine laboratory tests usually provide little, their role is increased if the dystrophy is caused by a genetic disease, or metabolic syndrome or malabsorption syndrome.**

## Laboratory markers

In malnutrition significant changes of protein metabolism - reduced levels of **total protein and serum albumin** detected;

in kwashiorkor significantly reduced levels of albumin and other transport proteins (transferrin, transthyretin, retinol-binding protein).

It is better to use for assessment the nutritional status - proteins with short half-life

## *Laboratory investigations – protein markers*

Protein	Period of half-life, days	Blood concentration
Albumin	20	42±2 г/л
Transferrin	8	2,8±0,3 г/л
Transtiretin	2	310±35 мг/л
Retinol-binding protein	0,5	62±7 мг/л

## Differential disease

1. hereditary metabolic disorders,
2. neuro-arthritic diathesis
3. malabsorption (cystic fibrosis, celiac disease, exudative enteropathy, disaccharidase deficiency, etc..)
4. endocrine disorders (hypothyroidism, congenital adrenal hyperplasia etc.)
5. neurological diseases, congenital malformations of central nervous system
6. infectious diseases, especially gastrointestinal tract,
7. congenital malformations of the cardiovascular system, gastrointestinal tract, and others.
8. bronchopulmonary dysplasia

**Differential diagnosis: Endogenous causes**

**Severe hypotrophy, which can not be treated by standard therapy, can be one of the first symptoms of these diseases.**

**Principles of treatment are the same as in the exogenous malnutrition, but on the first place - treatment of the underlying disease.**

# Principles of treatment

- Complex,  
taking into account **the cause and degree of malnutrition.**

## Provides

**Organization of day regimen, care, education, massage and gymnastics; a balanced nutritional support and diet therapy;**

**medical therapy, including enzyme- and vitamin therapy, correction of intestinal biocenosis, symptomatic and stimulating therapy**

# Treatment

Care and day regimen:

The room temperature is within 24-26 C,

Walking with the child several times a day,

take the child on the hand, talk to him,

massage and exercises, daily bathing.

# Treatment

WHO experts (2003) developed recommendations for the management of children with malnutrition, including 10 basic steps:

1. prevention and treatment of hypoglycemia,
2. prevention and treatment of hypothermia,
3. prevention and treatment of dehydration,
4. correction of electrolyte balance,
5. correction of micronutrient deficiencies (minerals and vitamins)
6. treatment and prevention of infectious complications
7. cautious start feeding
8. provision of weight gain and growth,
9. providing sensory stimulation and emotional support,
10. further rehabilitation.

## Treatment

- 1st step - **prevention of hypoglycemia.**
- If the blood glucose level below 3 mmol / l - IV bolus of 50 ml of 10% glucose solution.
- Fed the child every 30 minutes during 2 hours in 25% volume of a conventional single feed with subsequent transfer to the feeding every 2 hours without an overnight interruption.

## Treatment

The 2nd step - prevention and treatment of **hypothermia**, since these children tend to both supercooling and overheating.

If rectal temperature is below  $35,5^{\circ}\text{S}$  child, it is an urgent need to warm

Attention to a child's clothing, lay in bed with a heating or radiant heat.

Dress the child in accordance with the season.

# Treatment

**In the absence of contraindications and minimum air temperature  $+5^{\circ}\text{C}$  - walking outdoors (with the feet warmer with temperatures around  $60^{\circ}\text{C}$ ).**

**At a lower temperature air - walk on the terrace.  
With a child you should walk several times a day, child should be taken on the hand, talk to him to create a positive emotional tone (sensory and emotional support)**

**Mandatory massage and exercises.**

**Daily warm ( $38^{\circ}\text{C}$ ) bath.**

# Treatment

- 3d step - treatment and prevention of dehydration.
- use special solutions for rehydration of children with malnutrition - 1 liter of which contains 45 mmol of sodium, 40 mmol of potassium ions, 3 mmol  $Mg^{2+}$  ions.
- Give the solution at dose 5 ml / kg every 30 min for 2 hours.
- These children need to be fed every 2 hours without an overnight break.

## Treatment

The 4th step -correction of electrolyte imbalance.

Necessary to ensure adequate intake of the child minerals, including potassium (4.3 mmol / kg / day) and magnesium (0.4-0.6 mmol / kg / day).

Use a special rehydration solution containing (in 2.5 liter) 224 g of potassium chloride, 81 g of potassium citrate, 76 g of magnesium chloride, 8.2 g of zinc acetate, 1.4 g copper sulfate, sodium selenate 0.028 g, 0.012 g of potassium iodide

Use 20 ml of this solution to 1 liter of food.

# Treatment

The 5th step - treatment and prevention of infectious complications in children with malnutrition and secondary combined immunodeficiency.

The 6th step - correction of micronutrient deficiencies and vitamins:

**iron** 3 mg / kg / day  
**zinc** 2 mg / kg / day,  
**Cu<sup>2+</sup>** 0.3 mg / kg / day  
**Folic acid** 1 mg / day

## Treatment

7th and 8th steps - to provide a balanced diet therapy, taking into account the severity of malnutrition, food tolerance and gastrointestinal disorders.

**There are 4 stages for diet:**

-adaptation

-minimal nutrition

-intermediate stage

-optimal feeding

Diet therapy is based on the principles of gradual and rejuvenation food - gradually bring the amount of food to the age norm.

The daily amount of food with malnutrition is  $\frac{1}{5}$  body weight (no more than 1 liter)

## Treatment

Regimen of the feeding at the stage of "Careful feeding »  
(WHO, 2003).

Day	Frequency	Single volume, ml/kg	Daily volume, ml/kg/daily
1-2	from 2 h	11	130
3-5	From 3 h	16	130
6-7+	From 4 h	22	130

## Treatment

- **Ideal food for a baby is a breast milk, in his absence - adapted milk formula.**
- **Preference is given to adapted yogurt products (formulas "Bellakt-bifidus 0-5", "5-12 Bellakt-bifidus", "NAN fermented milk", "Semper Bifidus 0-12", etc..), since they stimulate the production of digestive juices, reduce the effects of dysbiosis, easily digested and assimilated.**

## **Diet – 1<sup>st</sup> stage - minimal nutrition**

**Child receives 0.7-2.0 g protein / kg day., Fat -2,0-4,0 g / kg, carbohydrate - 8,0-11,0g / kg, calories - 60-100 kcal / kg day.**

**In severe malnutrition - use enteral and parenteral (amino acids and concentrated glucose solutions) nutrition.**

**Fat emulsions added to parenteral nutrition program only after 5-7 days of started therapy.**

**Nasogastral tube feeding.**

## **Diet – 2<sup>nd</sup> stage – intermediate nutrition**

Child receives the full amount of food (2/3 main formula and 1/3 special solutions). The amount of protein is gradually brought to the 4-4,5g / kg day., Fat - to 5-6g / kg day. Carbohydrates - up to 13-14 g / kg day., Calories - 120-130 kcal / kg days.

Duration of this period is up to three weeks.

**Next step - optimal nutrition** - increase feeding quantitative and qualitative.

Diet expands - supplements expanding - yolk, vegetable oil, cream, cottage cheese, meat.

At this stage, the amount of protein - 4-4,5g / kg day. Fat - 5-6 g / kg day. Carbohydrates - 15-16g / kg day., Calories - 130-140 kcal / kg day.

**The amount of basic physiological nutritional food ingredients per 1 kg of body weight according to the age standards during physiological nutrition.**

## Treatment

**Gradually increasing the caloric content of food and changing its composition, making the transition to the 5-7 single daily feeding with constant tube (naso-gastral) feeding at night.**

**When you reach the amount of daily feedings of 50-70% constant feeding completely stop.**

**In the future, the diet of the child closer to the normal parameters by expanding the range of products, increasing the daily volume of food and reduce the number of feedings.**

# Medications

*Therapy with enzymes appointed with malnutrition due to the low level of child's own enzymes*

*Optimal microspherical and microcapsule form of pancreatin of 1000 IU / kg of lipase per day in 3 divided doses with meals): Creon, pantcitrat, pancreatin, panzinorm, meksaza, festal and others.*

## Treatment

The 10th step involves long-term rehabilitation, including good nutrition, good care with sensory and emotional support, vitamin and microelement correction.

### Prescribed

vitamins (initially parenteral administration, and then orally - vitamins C, B1, B5, B6, B12, B15, folic acid, subsequently-vitamin A, E, PP et al.).

- stimulating and metabolic agents

- inosine (10 mg/kg/day in 2 divided doses during 3-4 weeks)

- potassium orotate (10 mg / kg / day in 2 divided doses 3-5 weeks)

- L-carnitine (20% solution, 10 drops 3 times a day, 4-5 weeks), apilak) and others.

- drugs that normalize intestinal biocenosis (bifidumbakterin, laktobakterin, bifikol etc..).

## Treatment of hypogalactia

If the cause of malnutrition is hypogalactia, you should make every effort to eliminate it.

It is recommended to use both breasts, do the breast massage, warm compresses to the breasts, and others.

Important enough rest a nursing mother, a balanced diet, liquids, if necessary inclusion in the diet formulas for nursing mothers - "Laktomil", "Femilak-2", "Olympic", "Enfa-mom", "Semilak."

Stimulation lactation contribute decoctions and infusions of some plants: dill, caraway, yarrow, nettle, fenhel

## Treatment of hypogalactia

- To improve lactation for mothers prescribed nicotinic acid (50-75 mg 15-20 minutes before feeding)
- vitamin E 10-15 mg 2 times a day
- vitamin A 8.6% - 4 drops twice a day
- gendevit (under 30 years) or undevit (after 30) 1 tablet;
- glutamic acid - 0.5 to 3 times daily one hour before feeding.
- You can use homeopathy - pulsatil, compositum, mlekoim, hamomilla on the proposed schemes.

## Evaluating the effectiveness of therapy

The main indicator of the adequacy of nutrition - weight gain.

Good find an increase in excess of 10 g / kg / day, average 5-10 g / kg / day.,

low - less than 5 g / kg / day.

Lack of increases in body weight may be due to

1. inadequate nutrition (wrong calculation of nutrition, limitation of the frequency and volume of supplements)
2. deficiency of specific nutrients, microelements and vitamins
3. mental problems (rumination, lack of motivation, mental illness),
4. Ongoing infectious process

**In kwashiorkor and marasmus treatment is carried out as in the III degree of malnutrition.**

**Deriving from the state of malnutrition takes a long period of-**

**malnutrition I degree 1-1.5 months,**

**2nd degree - 2.5-3 months**

**Grade 3 - 4-5 months, and sometimes more if all the necessary requirements and conditions.**

## Prevention

•antenatal  
organization

fetal

health

• proper care regimen

•natural and proper nutrition with the expansion of  
it in accordance with the age

•Early diagnosis and treatment of opportunistic  
diseases

## **Out-patient supervision**

**Children who experience wasting observed  
once every two weeks if indicated.**

**analyzed:**

**appetite**

**stool**

**anthropometric data**

**(weight and length gain)**

**calculate the nutrition**

**prescribed massage and exercises, etc**

# Parathrophia

chronic digestive disorder in infants with body weight increase or decrease according weight, but not more than 10%, or with normal weight, but with presence of the classical signs of dystrophia

## Ethiology

- **Underlying - nutritional reasons:**
- **overfeeding, food with an excess of carbohydrates (a few supplementary feeding on the day of cereals, abuse of bananas, cookies, sugary juices, etc..)**
- **diet with excess of protein (overfeeding cheese, whole milk, protein enpits etc.).**
- **Poor nutrition of pregnant with an excess of carbohydrates, with a deficiency of protein, vitamins and minerals.**

# **Parathrophia**

**Predisposing factors**

**Anomaly of constitution - Diathesis**

**Lympho-hypoplastic**

**Allergic**

**Frequent infectious diseases**

**Anemia.**

## Clinical picture

- **Excessive weight gain.**
- **Subcutaneous fat layer over-emphasized with a predominance in the lower abdomen, legs**
- **Child pasty, reduced turgor.**
- **Low immunity with frequent intercurrent disease,**
- **Decrease in blood phospholipids, increased free fatty acids, cholesterol. This creates the conditions for the formation of early atherosclerosis.**
- **Carbohydrate digestive disorder characterized by the development of hypovitaminosis B1.**
- **Skeen - exudative catarrhal diathesis**



**Diagnosis is based on the clinical picture plus signs of dystrophy .**

**The differential diagnosis exogenous nutritional, unbalanced diet and endogenous - endocrinopathy, neuroendocrine disorders, and others.**

## Treatment of parathrophia

- correction of reasons of
- organization of optimal environmental conditions – day regimen, proper nutrition quantitative and qualitative
- Vitamins (B6, A, B12, E, B6, Bc, B15, etc..)
- Enzymes
- stimulation therapy (herbal adaptogens dibazol, pentoksil et al.)
- walking, massage, gymnastics,
- daily bath, tempering the age, physical and neuro-psychological condition of the child

## Prophylaxis / prevention

- breast feeding,
- proper diet with sufficient vitaminisation as a nursing mother and the child,
- organization and proper care regime
- prevention of rickets, anemia,
- microelements

***Thank you for  
attention !***

