Ministry of Public Health of Ukraine
National O.O. Bohomolets Medical University

METHODICAL GUIDE
to practical classes for students

Educational discipline	Propaedeutics of Pediatrics including nursing practice, basic medical skills in the pediatric department
Training direction	22 " Public Health "**,** II (master's) educational and qualification level
Specialty	222 «Medicine»
Department	Paediatrics # 2
Thematic module 3	Types of infant feeding. Feeding of children older than one year. Peculiarities of metabolisms in children.
Topic:	Principles and organization of rational nutrition for children older than one year.
Course	3

Approved on methodic meeting of department of pediatrics №2 from «28» august 2023., protocol №1

Considered and approved: CMC on pediatric disciplines from «28» august 2023., protocol №1

1. Purpose: the student acquires knowledge about the peculiarities of the diet and nutrition of children in different age periods older than 1 year of life;
acquisition the skills to provide the necessary recommendations to parents regarding the formation of positive patterns (patterns, systems) of food behavior in children of different age groups.

2. Competencies:

1. Determination of qualitative and quantitative analysis of the diet of patients of different ages.
2. Identifying deficiencies, correcting the diet and providing recommendations to the patient regarding the rational organization of nutrition.

Equipment: tables of the main food ingredients in baby food products, a notebook, a pen.

3. **Plan and organizational structure of the lesson**

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Stage name	**Stage description**	**Levels of assimilation ***
Preparatory stage	Organizational measures Setting educational goals, student motivation	*
The main stage	Test control on the subject of the lesson, checking and announcing the results. - theoretical survey; - demonstration of practical skills, clarification of the most important points regarding the preparation of a daily diet for a healthy child older than 1 year; - students' work on acquiring skills in preparing a daily diet for a healthy child older than 1 year; - acquisition by students of the skills of evaluating the results of the prescribed diet and, if necessary, making its adjustments. Solving tasks according to the subject of the lesson	** *, **, *** **, ***,****
Final	Analysis and assessment of student work results. Announcement of the topic of the next lesson, an indicative map for independent work with literature.	*
	Together 2,5 academic hours	

Introductory, **reproducible, *** reconstructive, **** creative learning levels.

4. Content of educational material

From the first day of birth until adolescence, a child experiences significant changes in physical, cognitive, and social-emotional development. A one-year-old baby takes its first steps into the big world, becomes increasingly independent in self-care skills and quickly learns to communicate. At the final stage, an 18-year-old young man goes out into the world, becomes independent in many areas and plans his future. The period from one year to 18 is extremely important, as it is responsible for the formation of not only the somatic and psychoemotional health of the future adult, but also the formation of personality, the ability to self-realize and successful existence in society.

An important factor in the formation of the health of the future adult is the inoculation of healthy eating patterns of the child. Failure to observe the principles of rational nutrition in childhood can lead to irreversible growth disorders, the altered formation of organs and tissues, and changes in the nervous and hormonal systems.

Nutritional needs. The primary factor in determining nutritional needs is primarily the rate and stage of a child's growth. Other factors are physical activity, body size, basal energy needs, and health status. Children's energy expenditure depends on age, gender, type of activity and season. Physiological daily needs of children in energy and nutrients, taking into account age and gender, are approved by *Order of the Ministry of Health of Ukraine No. 1073 of 03.09.2017 "On approval of the norms of physiological needs of the population of Ukraine in basic nutrients and energy"* and are listed in Table 1.

Tab. 1. Children's daily need for proteins, fats, carbohydrates and energy

Age group	Energy, kcal	Proteins (g)		Fats (g)	Carbo hydrates (g)
		all	animal		
*0 – 3 mon.**	*120*	*2.2*	*2.2*	*6.5 (0.7**)*	*13*
*4 – 6 mon.**	*115*	*2.6*	*2.5*	*6.0 (0.7**)*	*13*
*7– 12 mon.**	*110*	*2.9*	*2.3*	*5.5 (0.7**)*	*13*
1 – 3 years	1385	53	37	44	194
4 – 6 years	1700	58	41	56	240
6years (pupils)	1800	60	43	58	260
7 – 10 years	2100	72	51	70	295
11–13 years (boys)	2400	84	62	84	327
11–13 years (girls)	2300	78	55	76	326
14–17 years (youth)	2700	93	68	92	375
14–17 years	2400	83	59	81	334

(girls)					

**For children 0-12 months. The daily requirement is given based on 1 kg of body weight*

***0.7 – daily need for oil (based on 1 kg of body weight).*

Despite the differences in the amount of recommended nutrients and culinary processing of products for children of different age groups, it is possible to formulate general principles of optimal (rational, balanced) nutrition, which will be able to ensure the most effective role of the alimentary factor in maintaining the proper level of health of children.

General principles of optimal nutrition

1. Adequate energy value of the diet, which corresponds to the energy consumption of the child;
2. The balance of the diet in terms of all replaceable and irreplaceable nutritional factors, including proteins and amino acids, dietary fats and fatty acids, vitamins, mineral salts and trace elements;
3. Sufficient content of *minor* biologically active compounds in the diet.

Recently, it has been established the fact of the existence of previously unknown food factors, so-called minor non-food biologically active components, which improve the quality of life and reduce the risk of developing many diseases (flavonoids, indoles, phytosterols, L-carnitine, choline, cobalt, silicon, etc.).

4. The maximum variety of the diet, which is the main condition for its balance;
5. Optimal diet;
6. Adequate technological and culinary processing of products and dishes, which ensures their high taste appeal and maximally preserves the initial nutritional value;
7. Taking into account the individual characteristics of children (intolerance of certain products or dishes, etc.);
8. Ensuring the sanitary and hygienic safety of food, including compliance with all sanitary requirements for the state of the food block, transportation, storage and distribution of products and dishes.

In accordance with these principles, the diets of preschool and school-aged children should include all food groups, namely: meat and meat products, fish and fish products, milk and dairy products, eggs, vegetables and fruits, bread and bakery products, cereals, pasta and legumes, sugar and confectionery. This is the only way to provide children with all the necessary nutrients.

Conversely, exclusion from the diet or excessive use of one or more groups of products will lead to a violation of children's health. Below is a brief description of the nutritional value of the specified products.

Proteins. They have special importance in the nutrition of the child. High protein needs are due to the intensive processes of growth and development of children. They are the main plastic material for the construction of new cells and tissues, perform regulatory, transport, homeostatic, catalytic, protective, energy functions. A high-quality protein composition is important to provide the body with essential amino acids. Proteins of animal origin are the most valuable for children, and the younger the child, the higher the protein quota in the diet should be. By the

age of 1.5 years, children receive 80-100% animal protein, after that the quota of plant protein gradually increases. The quota of animal protein in 1.5 - 2.0 years is 75%, in 3 - 4 years - 70%, in 5 - 10 years - 60%, and in 11 - 17 years - at least 50%. Some essential amino acids* have a direct effect on the growth of the child. Such amino acids include methionine, lysine, tryptophan, and arginine, which are rich in the proteins of milk, dairy products, meat, fish, and eggs.

* Unlike replaceable amino acids, ***essential amino acids*** cannot be synthesized in the human body and must be obtained from food. They are synthesized by plants, fungi, and bacteria. The following amino acids are indispensable for the human body: Arginine; Valine; Isoleucine; Leucine; Lysine; Methionine; Threonine; Tryptophan; Phenylalanine.

Fats. Fats, like proteins, are an important part of children's nutrition. The younger the child, the greater the amount of fat in his diet. Thus, in young children, fats make up 40-50% of the energy value. Fats are necessary not only as an energy material, but also as an important component of the development of the nervous system (the brain contains up to 60% fat). As the child grows, the fat quota in the diet decreases and is already 30% in the diet of schoolchildren. Fats have a large amount of biologically active substances - fat-soluble vitamins, polyunsaturated fatty acids (PUFA), etc. The main source of fats for children are dairy products, butter, fats included in meat, fish, and eggs.

The child's body's need for ***polyunsaturated fatty acids*** is provided by the consumption of oil and is at least 15-20% of the total fat content. Of particular importance for the normal development of a child are ***omega-3 PUFAs***, which play an important role in brain development. Brain cells are rich in omega-3 PUFAs, especially docosahexaenoic acid (DHA), which accumulates in synaptic membranes and is involved in transmembrane transmission of synaptic signals. In addition, DHA takes part in the synthesis of phosphatidylserine, an important phospholipid of nervous tissue. Phospholipids are the main component of cell membranes of all organs, so the need for them in the child's body is extremely high. ***Cholesterol is not limited*** in the diet of children, as it is the main component of building cell membranes, a source for the synthesis of vitamin D, steroid hormones of the adrenal cortex and sex hormones. Despite the higher need for saturated fats in children's bodies compared to adults, it is not recommended to abuse them due to the risk of obesity, especially in children who lead a sedentary lifestyle.

Carbohydrates. Carbohydrate needs depend on age and physical activity, their amount in food increases with age and already at school age makes up 50-60% of the energy value of the diet. With an insufficient amount of carbohydrates in the diet (which is a rather rare phenomenon), protein catabolism increases and the use of fats increases with the formation of ketone bodies, which can be the cause of ketoacetonemic states. Increased protein breakdown with the release of ammonia, which causes intoxication, increases the burden on the liver and kidneys. At the same time, the amount of protein used in the construction of tissues decreases, which leads to a violation of the processes of growth and development of the child. It is important to remember that ***80-85% of the daily amount of carbohydrates*** in the diet should be provided by polysaccharides of plant products (whole grains, vegetables, potatoes) -

the so-called ***"complex carbohydrates"*** - which are slowly absorbed and do not cause a load on the insular apparatus of the pancreas.

"Simple carbohydrates" should be obtained from fruits and berries, a small amount of sugar and honey (no more than 20 g per day). It has been proven that 30 g of sugar consumed per day stimulates the occurrence of caries, accelerates puberty, which shortens life expectancy. An excessive amount of fructose, glucose and galactose contributes to the development of excess body weight, obesity, diabetes, and also reduces the resistance of the child's body to infections.

Vitamins. Vitamins are of special importance for the child's body due to their direct participation in the regulation of metabolism, the functioning of enzymes, hormones, the immune system, etc. The daily vitamin needs of the children's population of Ukraine (Order of the Ministry of Health of Ukraine No. 1073 of 03.09.2017 "On approval of the norms of the physiological needs of the population of Ukraine in basic nutrients and energy") are shown in Table 2.

Table 2. Children's daily need for vitamins

Вікова група	A (mcg PE)	Biotin (mcg)	Pantothenic acid (mg)	Д (mcg)	E (mg TE)	K (mcg)	C (mg)	B_1 (тіамін, mg)	B_2 (рибо-флавін, mg)	PP (mg HE)	B_6 (mg)	B_{12} (mcg)	Folate (mcg)
0-3 місяці	400	5	1,7	8	3	5	30	0,3	0,4	5	0,4	0,5	25
4-6 місяців	400	5	1,7	10	4	8	35	0,4	0,5	6	0,5	0,5	40
7-12 місяців	500	6	1,8	10	5	10	40	0,5	0,6	7	0,6	0,6	60
1-3 роки	500	8	2	10	6	15	45	0,8	0,9	10	0,9	0,7	100
4-6 років	500	15	3	10	7	20	50	0,8	1,0	12	1,0	1,0	150
6 років (школярі)	500	15	3	10	8	25	55	0,9	1,1	13	1,1	1,2	200
7-10 years	500	20	3	5	10	30	60	1,0	1,2	15	1,2	1,4	200
11-13 years old (boys)	600	25	4	5	13	45	75	1,3	1,5	17	1,5	2,0	300

11-13 years old (girl)	600	25	4	5	10	45	70	1,1	1,3	15	1,3	2,0	300
14-17 years old young men	600	40	4	5	15	65	80	1,5	1,8	20	1,8	2,0	400
14-17 years old girls	600	40	4	5	13	55	75	1,2	1,5	17	1,5	2,0	400

It is important for children to ***receive absolutely all groups of vitamins***. That is why children of preschool and school age should eat vegetables, fruits, and fruit juices every day. Children of preschool age should receive 150-200 g of potatoes and 200-250 g of other vegetables (cabbage, cucumbers, tomatoes, carrots, beets, radishes, leafy vegetables, etc.) daily, and school children - 250-300 g of potatoes and 300-400 g of other vegetables. vegetables in the form of salads, vinaigrette, vegetable purees, casseroles, soups, saute, stew, etc.; 200-300 g of fruits and berries in the form of fresh fruits (apples, pears, cherries, cream, cherries, raspberries, strawberries, grapes) and a variety of homemade fruit and vegetable juices with pulp and smoothies without added sugar.

Vitamin D is increasingly recognized as one of the most important nutrients due to its role in maintaining bone health and other potential effects, including its role in preventing cancer, obesity, autoimmune disease, and infectious diseases. The American Academy of Pediatrics recommends ***400 IU of vitamin D per day for all infants, children, and adults*** starting in the first days of life. Analysis of data from the National Health and Nutrition Examination Survey (NHANES) shows that vitamin D deficiency occurs in 9% of children, and its insufficiency - in 61%.

Minerals. Minerals perform various functions, including plastic and regulatory. Intensive growth and formation of the skeleton cause a child's high need for minerals. The daily mineral requirements of the children's population of Ukraine (Order of the Ministry of Health of Ukraine No. 1073 of 03.09.2017 "On approval of the norms of physiological needs of the population of Ukraine in basic nutrients and energy") are shown in Table 3.

Table 3. Daily need of children's population in minerals

Age group	Mineral substances

	Calcium (mg)	Phosphorus (mg)	Magnesium (mg)	Iron (mg)	Zinc (mg)	Iodine (mcg)	Selenium (mcg)	Fluorine (mcg)	Copper (mg)
0-3 months	400	300	50	4	3	90	17	1,0	0,3-0,5
4-6 months	500	400	60	7	4	90	17	1,0	0,3-0,5
7-12 months	600	500	70	10	7	90	17	1,0	0,3-0,5
1-3 years	800	800	100	10	10	90	20	1,2	0,3-0,7
4-6 years old	800	800	120	10	10	90	20	1,5	1,2
6 years (pupils)	800	800	150	12	10	100	30	2,0	1,5
7-10 years old	1000	1000	170	12	10	120	30	2,5	1,5
11-13 years old (boys)	1200	1200	280	12	15	150	40	2,5	2,0
11-13 years old (girls)	1200	1200	270	15	12	150	45	2,5	1,5
14-17 years old (young men)	1200	1200	400	12	15	150	50	2,5	2,5
14-17 years old (girls)	1200	1200	300	18	13	150	50	2,5	2,0

Calcium, phosphorus, magnesium, manganese, silicon, and copper are important for the formation of the skeleton and growth of children, which determines high need for them in young children.

Features of nutrition of children of different ages

Nutrition of children aged 1 to 6 years. Nutrition of children ***aged 1 to 1.5 years*** is similar to nutrition up to 1 year, except that the diet gradually expands due to the introduction of various soups, purees, fish dishes, cheese, and fresh vegetable salads. The culinary processing of food does not change. Most dishes are given in pureed form, but there must be dishes cut into pieces or whole (this is absolutely necessary for the proper formation of a proper bite, chewing, and peristalsis). The lack of solid foods and dishes contributes to the development of constipation and forms a long-term habit of eating homogenized food in the child. 5-course meal plan. The total volume of the daily ration is 1100-1200 ml, its distribution between feedings remains even.

The period ***from 1.5 to 3 years*** is transitional to similar adult nutrition. During this period, the child's molars appear, the sense of taste develops, the gastrointestinal tract improves, and the exocrine function of the pancreas increases. The quota of solid food in the diet is increasing. The volume of food gradually increases to 1400-1600 ml per day, the child is transferred to 4 meals a day. The distribution of food by energy value into separate meals is changing: breakfast and dinner make up 25% of the daily energy value of the ration, lunch - 35%, afternoon tea - 15%. At the age of 3 to 6 years, the daily volume of food increases to 1800 ml. Breakfast makes up 25% of the daily energy value of the diet, lunch - 35 - 40%, snacks - 10% and dinner - 20 - 25%. The amount of dairy products reaches 600 ml per day.

To form positive patterns of healthy eating behavior, you should remember the following:

1. The food traditions of the family have the greatest influence on the formation of food preferences and food behavior of young children. A child forms the habit of eating what his parents and other close family members eat, that is, what he often sees on the table.

2. When expanding the child's diet, parents need to show perseverance and tolerance. *Persistence in this case has nothing to do with coercion.* In order to introduce a new product to a child's diet, she must first get used to its appearance, texture, and smell. For this, the product must be offered to the child at least 15 times. It is useful to give the child the opportunity to hold the product in his hands, suck it, tear it into smaller pieces, etc. - these are all stages of the child's acquaintance with this product.

3. Due to the rapid development of sugar addiction, it is recommended to limit it as much as possible in the child's diet. The same applies to dishes and products containing trans fats. Alternatives to desserts with added sugar and hydrogenated fats are homemade banana casseroles, fruit/berry jellies, mousses, cheesecakes, fruit and cheese spreads, cherub and dried fruit candies, granola and crunchies. It is recommended to use banana, honey, coconut sugar, stevia as a sweetener, and *butter (82% fat content)* butter, coconut oil, cocoa butter as a source of fat useful for the child's health.

4. You should not use any food as a reward (give a favorite food, sweets to a child to reward him for something or to calm him down), as this contributes to the

formation of a harmful partner, which can become the basis of conditioned-reflex overeating in the future.

5. The child should not be allowed to manipulate the parents using food. It must be remembered that as a result it will harm the child itself.

6. Eating should take place at the time set aside for this - the same time every day, preferably in the family circle, in a cozy atmosphere (without the TV or other gadgets turned on). If the child refuses to eat, it is necessary to explain to him that he will be able to get food at his next appointment. The habit of "snacking" is generally harmful to health, and also contributes to the fact that, due to the suppression of appetite, the child will eat less at the main meal.

Recommendations for improving the eating process:

1. The child should not be too hungry or too tired at the time of eating
2. The child must sit comfortably at the table, it should be easy for him to reach the plate
3. It is necessary to provide support for the child's legs, for example, put a special chair or a stand under the legs
4. It is recommended to use strong plates that do not break, with high edges that prevent food from scattering
5. You should use blunt spoons and forks with convenient short handles and small, wide cups that do not break.

5. **Theoretical questions for the lesson:**

1. Factors determining nutritional (food) needs of children.
2. Factors affecting the formation of eating behavior of children of different age groups.
3. General principles of optimal (rational, balanced) nutrition, which will be able to ensure the most effective role of the alimentary factor in maintaining the appropriate level of children's health.
4. Peculiarities of qualitative and quantitative provision of proteins in the diet of children of different ages.
5. Features of the qualitative and quantitative provision of fats in the diet of children of different ages.
6. Features of the qualitative and quantitative supply of carbohydrates to the diet of children of different ages.
7. Peculiarities of nutrition for children aged 1-6 years.
8. Peculiarities of nutrition of younger schoolchildren.
9. Peculiarities of nutrition of high school students.

Recommended literature.

Basic:

Nelson textbook 21th Edition by Robert M. Kliegman, MD, Joseph St. Geme, Nathan J. Blum, Samair S. Shan, Robert C. Tasker, Karen M. Wilson, Richard E. Behrman Видавництво: Elsevier, 2019. P. 544-545.

Additional:

1. Fundamentals of pediatrics according to Nelson. Karen J. Marcdante, Robert M. Kligman; translation of the 8th Eng. edition in 2 volumes. Scientific editors of the translation V.S. Berezenko, T.V. Rest Kyiv: VSV "Medicine", 2020.

2. Katilov O.V., Dmitriev D.V., Dmitrieva K.Yu., Makarov S.Yu. Clinical examination of a child. 2nd edition. Vinnytsia: Nova Kniga, 2019. 520 p.

3. Pediatrics: textbook. T.O. Kryuchko, O.Y. Abaturov, T.V. Kushnereva et al.ed. by T.O. Kryuchko, O.Y. Abaturov. Kyiv : AUS Medicine Publishing, 2016. 208 p. (p.39-49) ISBN 978-617-505-485-7.