

Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	PERIODS OF CHILDHOOD
Course	3
Faculty	Medical №2

Kyiv -2019

Authorship

TEAM OF SPECIALISTS OF THE DEPARTMENT OF PEDIATRICS №4 NATIONAL MEDICAL O.O. Bogomolets UNIVERSITY

HEAD OF THE DEPARTMENT - DOCTOR OF MEDICAL SCIENCES, MD, PhD, ACADEMICIAN of the NAMS of Ukraine PROFESSOR V.G. Maidannyk., MD, PhD, ASSOCIATE PROFESSOR Ie.A. Burlaka; MD, PhD, ASSOCIATE PROFESSOR R.V. Terletskiy, MD, PhD Assistant T.D. Klec.

PERIODS OF CHILDHOOD

Topic relevance. Child's organism is constantly changing in the process of individual development, and different systems and organs formation takes place at definite time. Childhood periodization is the chronological basis for studying and understanding the regularities of child's growing up and developing, as well as the peculiarities of their morbidity depending on their age.

The aim of the lesson: to study the chronological structure of child's age, to study the peculiarities of children's growing, development and morbidity at different age.

Follow-up questions:

1. Different childhood periods chronology, critical periods.
2. Peculiarities of all critical childhood periods.
3. Peculiarities of the newborn's organism and transitory states of the newborn period.
4. Morbidity peculiarities at different childhood periods.

Having covered the topic, the student should be able to:

1. Define the periods of children's age.
2. Single out critical periods in children's development.
3. Define maturity and ripeness of newborns, transitory states of the newborn period, estimate the state of a newborn child.

Relevant materials

Prenatal Period (280 days before birth)

Intrauterine development is a stage of first manifestations of human motor skills.

Childhood

- 1) **Newborn child (6 weeks)** period of innate reflex movements
- 2) **Suckling (6 weeks to 1 year)** period of body straightening, grabbing and locomotion

3) Early childhood (1 to 3 years) period of developing walk, run and handling objects

4) Pre-school childhood (3 to 7 years) period of developing new, mainly overall, movements

5) School childhood (7 to 11 years) period of enhanced motor learning

Adolescence

1) Puberty (11 to 15 years) period of differentiation and redevelopment of motor skills

2) Adolescence (15 to 20 years) period of integration and completing motor development

Adulthood

1) Early adulthood (20 to 30 years) period of the climax of motor efficiency

2) Middle adulthood (30 to 45 years) period of stabilized motor efficiency

3) Late adulthood (45 to 60 years) period of decline in motor efficiency

Old Age

1) Early old age (60 to 75 years) period of initial involution of human motor skills

2) Middle old age (75 to 90 years) period of involution of human motor skills

3) Late old age (over 90 years) period of decline in human motor skills

Intrauterine Development

Duration: 10 lunar months = 280 days (setting duration of pregnancy, first date according to embryo size, second date according to first outer movements of fetus)

Division:

Embryo period = first two lunar months

Fetus period = the remaining eight lunar months

Tests

1. Point out the gestation age of a full-term newly-born:

1.1. 28-38 weeks.

1.2. 38-42 weeks.

1.3. 39-40 weeks

1.4. 40-42 weeks.

2. A child is considered to be full-term if its weight is:

2.1. 2500-4000 gr.

2.2. 3000-3500 gr. 2.3. 2300-3800 gr. 2.4. 2000-3500 gr.

3. A newborn's body length is:

3.1. 50-54 cm.

- 3.2. 45-58 cm.
- 3.3. 40-50 cm.
- 3.4. 50 cm and more.
4. Which of the given below states is a pathology for the new-born period?
 - 4.1. Physiological loss of weight.
 - 4.2. Physiological jaundice.
 - 4.3. Physiological hyperthermia.
 - 4.4. Aspiratory dysfunction syndrome.
 - 4.5. Sex crisis.
 - 4.6. Kidneys uric acid infarct.
5. Which of the given below is a characteristic feature of a newly- born unripeness?
 - 5.1. Adequate development of hypodermic cellular tissue.
 - 5.2. Head hair is 2—3 cm long.
 - 5.3. Nails are soft and do not reach finger-tips,
 - 5.4. Testicles are in the gate, girls' large lips of pudendum cover small lips of pudendum.
 - 5.5. Lanugo is found on shoulders and upper part of the back.
6. Point out the wrong statement. The new-born period is the most critical in a child's life due to the fact that:
 - 6.1. All the functions of a child's organism are in the state of unstable balance.
 - 6.2. Adaptation of all systems for extrauterine existence takes place.
 - 6.3. There take place intensive metabolic adaptation and catabolic exchange direction during the first days of life.
 - 6.4. There is an active conditioned reflexes formation.
7. An infant period belongs to critical childhood periods because of the following:
 - 7.1. Active re-built of cardiovascular and respiratory systems is in process.
 - 7.2. Enlargement and development of movements take place.
 - 7.3. The organism is under the parasympathetic nervous system's influence.
 - 7.4. Wide vaccination takes place.
8. The following is characteristic of the children of young age morbidity:
 - 8.1. Deficiency diseases presence.
 - 8.2. Children's infections appearance (measles, epidemic parotitis).
 - 8.3. Immune system dysfunctions.
 - 8.4. Inclination for infections generalization.
 - 8.5. Different diatheses features appearance.
9. The following belongs to the physiological state of the newly- born period:
 - 9.1. Physiological hypoproteinemia.
 - 9.2. Physiological hypimmunoglobulinemia.

- 9.3. Physiological erythema.
- 9.4. Physiological sympathicotonia.
- 10. The "3 years old crisis" is determined by:
 - 10.1. Intensive higher nervous activity development, inquisitiveness, and inability to perform the desired.
 - 10.2. Intensive body growth which outruns vessels growth.
 - 10.3. Visiting pre-school children's establishments by a great number of children, and the consequent morbidity increase among them.
 - 10.4. Chronic pathology formation which takes place at this period.

Correct answers: 1.2; 2.1; 3.2; 4.4; 5.3; 6.4; 7.2; 8.2; 9.3; 10.1.

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Methodological recommendations for students

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Topic	PHYSICAL DEVELOPMENT OF CHILDREN
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PHYSICAL DEVELOPMENT OF CHILDREN

Topic relevance. Physical development is one of integral indices of a child's state of health, of biological ripeness of all the organism's systems. The main methods of physical development investigation are easy for children of any age, which pre-supposes their wide application in pediatrics practice.

The aim of the lesson: to master the methods of main anthropometric measurements of children of different age, to be able to estimate a child's physical development by means of different methods, to point out reasons for deviation.

Follow-up questions:

1. The methods of main anthropometric measurements and necessary equipment.
 2. Indexes of the physical development of a newly-born child.
3. The regularities of the enlargement of body weight and length, of thorax and head circumference at different age.
 4. Factors which influence children's physical development.
 5. Semiotics of physical development deviations.
 6. Notions of acceleration and de-acceleration.

Having covered the topic, the student should be able to:

1. Measure the enlargement of body weight and length, of thorax and head circumference.
2. Make approximate calculation of main anthropometrical indexes for a child of any age.
3. Estimate the physical development of a child using centile and sigmal standards schemes and graphics of individual development of a child.

Relevant materials:

- Definition and content of physical development.
- Regularities of main children's anthropometric indexes enlargement.
 - Methods of children's physical development evaluation.
- The scale for children's physical development evaluation by means of different methods.
 - Semiotics of physical development deviations.

Definition and Content of Physical Development Evaluation

Physical development is a complex of morphological and functional indexes which characterize processes of child's growth and biological ripening, the storage of physical power.

Complex evaluation of physical development includes:

- evaluation of the results of anthropometry and somatoscopy. Anthropometry is a unified methodology of a human being's body or its parts measuring. Somatoscopy includes examination and description of body proportions and outward appearance indexes;

- evaluation of the functional state of different systems of organism. Dynamometry (hand muscular power measurement), spirometry (functional investigation of respiratory system), and functional tests of cardiovascular system are traditional procedures;

- detecting of a child's biological age (most often the bone age is established by means of X-ray photograph of a hand).

Such complex evaluation is made in case of a significant deviation of child's physical development or if a child is suspected to have an endocrine, genetic or other diseases, or in children's groups on a special task. A district pediatrician usually deals with anthropometric data evaluation only.

Main laws of growth

1. The growth is the reflection of systematic process of the development. Body length increase for doctor is an indicator of child's organism development monitoring.

2. Slowdown of the growth rate with the age. Maximal temps of growth are in intrauterine development, first months of postnatal life, then – first years of life, etc.

3. Irregularity of the growth rate changes. This law describes short periods of childhood (“leaps” of growth), during which the body length increases especially quickly. The first one takes place at the age from 5 to 8 years and the second one – 12 – 15 years of life.

4. Craniocaudal direction of growth. After the birth distal parts of the body grow faster than upper and proximal ones. Thereby foot growth faster than ankle, ankle faster than tie and the least is the head's increase.

5. Alternation of growth directions. Each separate bone and the whole skeleton in general are growing by gradual changing of elongation phases and pachynosis phases.

6. Sex specificity of the temps of growth. This law explains a tendency to faster temps of skeleton growth in boys. At the same time biological development in girls is significantly faster and touches all physiological systems and organs.

7. Growth asymmetry. Initiation of growth shifts and their some outstripping always take place on a side of leading hand efficiency.

Factors, estimating the growth of children

1. Genetic factors. It is considered that more than 100 genes are regulating growth rate, limits and some final peculiarities of body structure. Endocrine and humoral growth stimulators are main objects of genetic and environmental regulation in growth

temps and limits variations. Among the most active growth regulating hormones are somatotropin, thyroid hormones, insulin and androgens.

2. Environmental factors. Alimentation is the most important factor in this group. For normal growth of the child he needs a food ration qualitatively and quantitatively balanced. Moving activity is another growth regulating factor. Giving a child recommendations about going in for sport, a doctor should always take into account that some kinds of sport activities stimulate the growth, another ones – inhibit it. The most positive influence on growing processes such kinds of sport as volleyball and basketball have. Among other factors of this group are such ones as sufficiency of sleep, emotional state of the child, acute and chronic diseases.

3. Unclassified group (number of pregnancy and labors, labors term, newborn's weight at birth, mother's age, season of child's birth). Influence of these factors is not significant but trustworthy.

Anthropometry is the totality of measurements' methods and description of the human's body in general and its separate parts. It allows to give quantitative evaluation and the human's physical development evaluation.

Anthropometric evaluation is widely used in medicine. One of the first procedures, which is carried out after the child's birth is his anthropometric investigation. Some serious diseases are often diagnosed after estimation of negative anthropometric changes. This causes a certain interest to anthropometry not only among doctors, but also among wide strata of population. The infant's body weight is evaluated on a special baby balance with maximally admissible load of 10 kg and measuring precision of 1 kg. Weighing is carried out in the morning after urination and defecation, in underwear. Weighing the infant younger than 1 year, the wrap is put on the baby's balance tray, the baby is put on baby balance, placing the head to wide part of the tray. Body weight (together with the wrap) indications are marked, after that the wrap's mass is subtracted.

The elder children's body weight measuring is carried out fasting in the morning on special medical scales with precision of 50 gr.

The full-termed infant's weight in birth makes 3200 – 3800 gr. on an average. In general, the normal weight is considered to be from 3500 to 4500 gr. The premature baby's weight makes 2500 gr. and lower. During the first days of life the infant's body weight decreases for 150 – 300 gr. (it is so called transitory, or physiological, weight loss) and makes about 5 – 9% of body weight in birth. The body weight decreasing more than 9 – 10% (300 gr.) is considered to be pathological loss of weight. Physiological weight loss is conditioned by the following factors:

- moisture's evaporations from skin and in breathing;
- umbilical cord's rest mummification;

- insufficient feeding and drinking value during the first days of life;
- vomiting with an amniotic fluid, swallowed during the labor;
- meconium and urine discharges.

The primary body weight restoration in newborns is realized by two versions:

I. *Ideal one* (the type of Bjuden): body weight loss on 3rd or 4th day of life and the primary level restoration on 7th – 10th day of life (it use to be in 25% of newborns).

II. *Slowed-up one* (the type of Peas): body weight loss during first 3 – 4 days with minimal delay during 1 – 3 days and slow primary weight restoration to 12th – 15th day (70 – 75% of children).

The ideal weight calculations in children of different age.

The full-termed newborn has 600 gr. of increase during the first month of life; during each month of the first half-year of life he has 800 gr., the second one – 400 gr.

1st month: +600gr.;

till 6 months: $M = m + 800 + n$;

till 1 year: $M = m + 800 \times 6 + 400 (n-6)$, where n – months of life;

Body weight of children elder than 1 year is calculated by formulas:

from 2 to 10 years: M (kg.) = $10 + 3n$, where n – the child's age in years;

elder than 10 years: $M = 30 + 4 (n - 10)$, where n – the child's age in years;

Body length. The length is the child's size from legs to head measured in horizontal position. Vertical measuring of the same size in standing position is called stature. Body length reflects the level of organism's maturity.

Body length in children of two first years of life is measured in lying position with the help of a special stadiometer – a board with centimetric scale. The child's vertex must closely adjoin the immobile plank of stadiometer. The head is fixed so that the lower orbit's margin and external acoustic meatus upper margin stay on the same level. The child's legs are straightened by slight pressing on his knees. Stadiometer's mobile plank is closely clasped to the child's heels.

In elder children the body length is measured with the help of vertical poctomip with a folding stool. The child stands on the stadiometer's platform turning her back to the scale. The child touches the scale with her occiput, interscapular area, sacral bone and heels. The head is fixed the same way - so that the lower orbit's margin and external acoustic meatus upper margin stay on the same level. Mobile plank is fixed at the head's upper point.

Ideal stature calculation in children of different age.

Body length in child of the first year of life may be calculated the next way:

for I quarter – 3 sm. every month (9 sm. in a quarter);

for II quarter – 2,5 sm. every month (7,5 sm. in a quarter);

for III quarter – 1,5 sm. every month (4,5sm. in a quarter);

for IV quarter – 1,0 sm. every month (3 sm. in a quarter).

The general body length increase for the first year of life makes 25 sm.

The child's body length doubles up to 4 years and trebles up to 12 years of age.

After the age of 1 year the next formulas are used:

till 4 years: $L = 100 - 8(4 - n)$;

after 4 years: $L = 100 + 6(n - 4)$, where n – years.

Head and chest circumferences are measured with the help of a tape-measure.

For head circumference measuring the tape is put from behind under scapulas' lower angles and in front – on the nipples' area.

The newborn's head circumference makes 34 – 36 sm., in children younger than 1 year this quantity increases generally on 1 sm. every month and equals 46 – 47 sm. to the age of 1 year.

Till 6 months: $43 - 1,5(6 - n)$;

after 6 months: $43 + 0,5(n - 6)$, where n – months.

After the age of 1 year the next formulas are used:

from 1 year to 5: $50 - 1(5 - n)$;

after 5 years: $50 + 0,6(n - 6)$, where n – years.

The newborn's chest circumference makes 33 – 35 sm. This quantity increases generally on 1,2 – 1,3 sm. every month and equals nearly 48 sm. to the age of 1 year.

Till 6 months: $45 - 2(6 - n)$;

after 6 months: $45 + 0,5(n - 6)$, where n – months.

After the age of 1 year the next formulas are used:

from 1 year to 10: $63 - 1,5(10 - n)$;

after 10 years: $63 + 3(n - 10)$, where n – years.

In children younger than 3 months the head circumference indexes exceed the chest's ones.

Methods of Children's Physical Development Evaluation

Physical development evaluation is made by means of comparing individual child's indexes with normative. Basic and mostly the only physical development evaluation method is conducting anthropometric investigation and evaluating the obtained data. Two main methods used are: approximate calculations and anthropometric standards.

The method of approximate calculations is based on the knowledge of basic regularities of body length, body weight, thorax and head circumference enlargement. Corresponding normative indexes can be calculated for a child of any age. The admissible interval of deviation of factual data from calculated data is $\pm 7\%$ for average physical development indexes.

This method gives precise idea of child's physical development and is used by pediatricians when providing home medical aid to children.

The method of anthropometric standards is more accurate, because individual anthropometric features are compared with normative in accordance with age and sex of a child. Regional schemes of standards are of two types: sigmal and centile.

According to centile standards method it is necessary to estimate centile interval corresponding to given (factual) sign taking into account child's age and sex. This method is not mathematizing one and perfectly characterizes variation rows in biology and medicine.

Table... Physical development evaluation scale

Evaluation	Standard deviations method	Centile standards method
Extremely high	-	Over 97-th centile
High	From M +2,1SD and more	From 90 to 97 centile
Higher than average	From M +1,1SD to M +2SD	From 75 to 90 centile
Average	M ± 1SD	From 25 to 75 centile
Lower than average	From M -1,1SD to M -2SD	From 10 to 25 centile
Low	From M -2,1SD and less	From 3 to 10 centile
Extremely low	-	Lower than 3 -rd centile

According to standard deviations (SD) method the factual indexes are compared with some average arithmetical value (M) for a given sign in the same sex and age group of inspected child. Received difference is expressed in standard deviations (SD), estimating the degree of deviation of individual data from their average value.

Tests

1. Physical development is a complex of morphological and functional indexes which characterize:
 - 1.1. Length, weight, and form of a child's body.
 - 1.2. Functions of separate organs and systems.
 - 1.3. Processes of growth and biological ripening of a child.
2. Admissible interval of average indexes of physical development according to the method of precise calculation makes:

- 2.1. 3%.
 - 2.2. 7%.
 - 2.3. 10 %.
3. Average value of the monthly enlargement of child's body length during the first 4 months of life makes:
- 3.1. 1 cm.
 - 3.2. 2 cm.
 - 3.3. 3 cm.
 - 3.4. 4 cm.
4. Which of the variants of physical development evaluation is the correct one?
- 4.1. Corresponding to a child's age.
 - 4.2. Average.
 - 4.3. Within the norm.
5. During the second six months of life the weight of a child enlarges by... per month:
- 5.1. 700 gr.
 - 5.2. 300 gr.
 - 5.3. 5.3.400 gr.
6. The weight of a child at the age of 2-10 enlarges annually by:
- 6.1. 4 kg.
 - 6.2. 3 kg.
 - 6.3. 2 kg.
 - 6.4. 1 kg.
7. How is child's physical development evaluated when the indexes value of anthropometric examination lie in the interval of 25- 10 centiles?
- 7.1. As average.
 - 7.2. As higher than average.
 - 7.3. As lower than average.
 - 7.4. As high.
 - 7.5. As low.
8. What interval must anthropometric examination indexes lie in if physical development is considered to be low?
- 8.1. 75-50 centils.
 - 8.2. 50-25 centils.
 - 8.3. 75-97 centils.
 - 8.4. 10-3 centils.
 - 8.5. 25-10 centils.
9. How many variants of physical development evaluation can be used if it is the method of sigmal standards?

- 9.1. 3.
- 9.2. 5.
- 9.3. 7.
- 9.4. 9.

10. How many variants of physical development evaluation can be used if it is the method of percentile standards?

- 10.1. 3.
- 10.2. 5.
- 10.3. 7.
- 10.4. 9.

Correct answers: 1.3; 2.2; 3.3; 4.2; 5.3; 6.3; 7.3; 8.4; 9.2; 10.3.

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1. Maidannyk V.G., Burlay V.G. Propedeutic pediatrics. 2012. – PP.1029.
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3. Feldman, R. S. (2011). Development across the life span. 6th ed., Upper Saddle River, NJ: Prentice Hall, ISBN 0205805914.

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Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S NERVOUS SYSTEM. NERVOUS-PSYCHIC DEVELOPMENT OF A CHILD. METHODS OF EXAMINATION. DEVIATIONS SEMIOTICS
Course	3
Faculty	Medical №2

**ANATOMIC AND PHYSIOLOGICAL PECULIARITIES
OF THE CHILDREN'S NERVOUS SYSTEM. NERVOUS-PSYCHIC DEVELOPMENT OF A
CHILD. METHODS OF EXAMINATION. DEVIATIONS SEMIOTICS**

Topic relevance. The knowledge of age peculiarities of the nervous system is necessary for the adequate evaluation of the general state of a child and its nervous-psycho development.

Follow-up questions:

1. Anatomic and physiological peculiarities of the children's nervous system corresponding to age.
2. Methods of investigation of the nervous system of children of different age.
3. Main indexes of nervous-psycho development of children corresponding to age.
4. Semiotics of children's nervous-psycho development deviations.

Having covered the topic,

the student should be able to:

1. Collect anamnesis, analyze complaints characteristic of the nervous system's damage, evaluate the data obtained.
2. Examine the nervous system of children of different age with the help of clinical, laboratory, and instrumental investigations.
3. Evaluate the nervous-psycho development of children of different age.

Peripheral nerves:

- there is a lack of myelinated (medullated) nerve fibers (neu- rofibra myelinata) (afferent fibers are first to myelinate, then the efferent ones);
 - intracranial nerves are myelinated before the 3rd month;
- greater part of peripheral nerves is myelinated before a child is 3 years old, funiculus of white matter - 4-7 years old.

Analyzers:

- *optical* - all newly-borns possess physiological photophobia, physiological nystagmus, physiological long sight, bigger breadth of accommodation, beginning from 6 months a child is able to differentiate colours;
- *acoustic* - sound perception of newly-borns is low due to the fact that tympanic sinus (sinus tympani) is filled with air; a child starts to differentiate sound at the age of 2 months, coordination of optical and acoustic analyzers takes place at the age of 7-8 months;

- *smell* - the threshold of sensitivity is lowered, newly-borns perceive strong smells only, but beginning from the 4th month a child is able to differentiate several smells;

- *gustatory* - newly-borns have broader perception field and higher threshold of sensitivity. Beginning from the 3rd month they are able to differentiate several taste feelings, delicate taste feelings are improved at early school age.

Perception:

- *tactile* is distinguished beginning from the 7th month of prenatal development, is better developed on face, feet, and hands;

- *temperature* is the highest threshold of sensitivity, child perceives cold better;

- *pain* is badly developed, forms up to the 6th day and has the highest threshold;

- *deep* (high-frequency, musculo-articular perception, pressure perception, weight perception) is formed up to the age of 2 years.

Vegetative nervous system:

- both sections are in functioning since the moment of delivery;

- noradrenaline prevails in the newly-borns' blood;

- transition from generalized vegetative reaction to localized, specified reactions takes place with age;

- from 3 up to 7 months parasympathetic nervous system prevails.

Methods of Children's Nervous System Examination

When a child is clinically examined it is necessary to pay special attention to the following aspects:

— while studying anamnesis it is necessary to denote reasons which influence nervous system formation in pre-natal and intranatal periods, as well as during the first months and years of a child's life;

— it is necessary to analyze the terms of static and motility functions development, conditioned reflex activity; for older children the information of their behavior at school and in the family, as well as information of their progress in studies is needed;

— when a child is examined, it is necessary to evaluate the behavior, reaction to the environment, mood, the expression of the face, movement coordination, the way of walking, and muscular tone;

— during examination one must establish the state of sinciput and joint of skull (of children of the first year of life), skin perception, the state of peripheral nerves and muscles, skin reflexes, tendon reflex, respondent reflex, and dermatographia peculiarities;

— one must prescribe the plan of examination (on the basis of the data obtained): the level of electrolyte in blood serum, neurosonography, electroencephalography, computer tomography, etc.;

— one must evaluate the results of laboratory and instrumental investigations.

The first year of life children's state of nervous system is characterized by unconditioned reflexes which disappear with age.

Transitory rudimentary reflexes are characteristic of movement analyzers development stage, disappear with age.

I. Oral segmental automatisms

Suction - if to put a nipple into the child's mouth, active movements appear (physiological state up to the age of 1 year).

Exploring (Kusmaul's) - if to strike the skin in the mouth region without touching lips, child's lips go down, its tongue moves aside and the head is turned to the side of stimulation (physiological state up to the age of 1 year).

Yoke - if to stimulate the child's lips with fingers, its lips are pulled out (resembles a yoke).

Babkina's (palm-mouth) - if to press the pad of a thumb the mouth opens and the head bows down.

II. Spinal segmental automatisms

Prehensile - the child snatches and firmly keeps an object when it touches the surface of its palm. Sometimes it is possible to lift the child (Robinson's reflex).

If to press the basis of the 2nd and 3rd toes, they will bend (physiological state up to the age of 2-4 months).

Moro's (encircling) reflex:

a) the child standing on doctor's hands is sharply lowered by 20 cm, and then is raised to the previous level;

b) child's legs are straightened with a sharp movement;

c) the surface the child lies on is beaten at a 15-20 cm distance from the child on both sides of its head.

Reaction: at first the child puts its hands aside and straightens fingers, then returns hands to the initial position.

Reflex of support - the child must be taken from the side of the back, the head must be supported with the 2nd finger - the raised child bows its legs in knee-joint. Being put down on a surface it supports with the whole foot, "stands up" on half-bent legs, the trunk is leveled (physiological state up to the age of 2 months).

Automatic walking reflex - when the child is in a supported pose being bowed a bit it "walks" on the surface without hands movement.

Crawl reflex (Bauer's) - the child is laid on its stomach so that the head and trunk are oriented to the middle line. In such a pose the child raises its head and makes crawling movements. If to place one's palms to child's feet, its movements are intensified, child's crawling is accompanied by hands movement (physiological state up to the age of 2 months).

Reflex of Galant - if to pass over with a thumb and 2nd finger along the paravertebral lines of the child lying on its side, the child must curve (physiological state up to the age of 2 months).

Reflex of Perece - the child must lie flat on its stomach. One passes over the spinal process of vertebra from coccyx up to neck. It results in body curving, upper and lower extremities bowing, head and pelvis rising, and sometimes in urination and dejection. This test is painful, that is why it is conducted the last (physiological state up to the age of 4 months).

III. Myeloencephalic pozotonic reflexes

Labyrinth tonic results in slight muscles tension during upper and lower extremities bowing if the child lies on its stomach, or in slight extensor tension during the change of position if the child lies on its back (physiological state up to the age of 1 month).

Symmetric neck tonic - during the passive newly-born's head bowing (the child lies on its back) muscular tonic increase takes place - hands and legs extensors. When the head is moved to its previous position, this tone disappears (this reflex is rare among healthy newly-borns, disappears at the age of 2 months).

Asymmetric neck tonic - the head of the lying child is turned so that its chin touches the shoulder. The tone of the extremities the child faces falls down. Sometimes they unbend for a short period of time and the tone of the opposite extremities increases (physiological state up to the age of 2-3 months).

IV. Mesencephalic adjusting automatisms

Labyrinth adjusting is absent or slightly expressed among newly-borns. During the first week of life the child tries to rise and keep its head (this reflex is well-expressed on the 2nd month of life).

Ordinary neck and body adjusting - the turn of head results in body's turn to the same side: at first the thoracic part, then the pelvis part (this reflex appears at the time of delivery and is changed to 6-7 months).

Meningeal signs and reflexes

Rigidity of occipital part of the head - pain and inability to put head on chest.

Babinsky's - the line stimulation of the foot in the direction from the external side of the heel to the big toe's base results in the big toe rear flexion and foot flexion of other fingers (physiological state up to the age of 2 years).

Kernih's - an attempt to unbend the leg, bowed in the knee and talocrural joints at a right angle (the child is on its back), turns out to be impossible (physiological state up to the age of 4-6 months).

Brudzinskyi's (physiological state up to the age of 3-4 months) -

the upper one: during the passive head bowing the quick leg bowing in the knee and talocrural joints is observed;

middle: if to press the thoracic region of an ill child with the palm edge, its legs are bending;

low.during the passive leg bowing in the knee and talocrural joints the other leg is bowed too.

Laceg's - the inability to bow the straight leg in a joint for more than 60-70°.'

For newly-borns diagnostics the system of *Flatau* (eye extension when the head is bowed forward quickly) and *Lessonage* (the child pulls legs to the stomach when lifted) are used in combination with clinical situation.

Children's Neuropsychic Development Evaluation

Age	Language	Socialization	Motor
2 mo	Coos (ooh, ah)	Smiles with social contact	Holds head up 45 degrees
4 mo	Laughs and squeals	Sustains social contact	Grasps objects, stands with support
6 mo	Imitates speech sounds	Prefers mother, enjoys mirror	Transfers objects between hands, uses a raking grasp, sits with support
8 mo	Jabbers (dadada)	Plays interactively	Sits alone, creeps or crawls
1 yr	Says "dada/mama" with meaning	Plays simple ball games, adjusts body to dressing	Stands alone, uses a thumb-finger pincer grasp
14 mo	Says 2-3 words	Indicates desires by pointing, hugs parents	Walks alone, stoops and recovers
18 mo	Says 6-10 words	Feeds self	Walks up steps with a hand held, imitates scribbling
2 yr	Combines words with a 250-word vocabulary	Helps to undress, listens to stories with pictures	Runs well, makes circular scribbles, copies a horizontal line
30 mo	Refers to self as "I," knows full name	Pretends in play, helps put things away	Climbs stairs with alternate feet, copies a vertical line
3 yr	Counts 3 objects, knows age and sex	Helps in dressing	Rides a tricycle, stands on one foot briefly, copies a circle
48 mo	Counts 4 objects, tells a story	Plays with other children, uses toilet alone	Hops on one foot, uses scissors to cut out pictures, copies a square and a cross
5 yr	Counts 10 objects, names 4 colors	Asks about word meanings, imitates domestic chores	Skips, copies a triangle

Meningeal syndrome

The clinical symptoms arising due to affection of meninges (inflammatory and non-inflammatory genesis), is referred to as meningeal syndrome. It's most frequent signs are:

1. **Headache** – In children of early age it is monotonous, i.e. monotonous with regard to sound of their cry.
2. **Nausea, vomiting** in small children, protrusion and pulsation of the frontal fontanel is a very significant sign for pediatrician.
3. **General hyperesthesia** – a painless touch of the skin of the child is accompanied by his getting anxious, crying, shouting.
4. **Rigidity of occipital muscles** – the doctor can't bend the head of the patient forward. For the designation of this symptom one hand is placed on chest and another on the backside of the head. Then simultaneously the chest is pressed downwards and the head upwards. Force of resistance should be determined.
5. **Meningeal position** – the head is thrown back, legs are pressed to the abdomen, the child lies on one side.
6. **Kerning's symptom**– if the kerning reflex is present in the child after 4 months of age, it is a sign of pathology.
7. **Brzezinski's symptom** (polish pediatrician)
 - **Higher** – the doctor bends the head of the patient forward, during this the legs are bent spontaneously in the knee and hip joints.
 - **Middle** – In reply to pressing above the pubis the lower limbs bend as described above.
 - **Lower** – In response to the flexion of one leg by the doctor in the knee and hip joint, the patient bends his other leg in knee and hip joints.
 - **Zygotic**– In response to the pressing of the cheekbone the child raises his shoulders and flexes his/her hands in the elbow joints (characteristic of tubercular meningitis)

Lesage's symptom – when the child is lifted up by holding him/her under the arms the legs are bent towards the abdomen.

Tests

1. Kerning's reflex is considered to be physiological up to the age of:
 1. 3 weeks
 2. 2 month
 3. 4 month
 4. 7 month
 5. This reflex is never physiological
2. The following are all basic oral reflexes, except of:
 1. Sucking reflex
 2. Babkin's reflex
 3. Kussmaul-Henzler search reflex
 4. Moro's Reflex

5. All of the above are all basic oral reflexes without exceptions

3. The child's vocabulary reaches around 300 words approximately at the age of:

1. 6 month
2. 12 month
3. 2 years
4. 3 years
5. Only when he starts school

4. Criteria for estimation of neuro-psychological development of a child of the first year of life are the following, except of:

1. Motility
2. Game activity
3. Statics
4. Speech
5. Conditional Reflexes

5. A child with average neuro-psychological development begins to walk at the age of

1. 4 month
 2. 7 month
 3. 17 month
 4. Any of the above age would be acceptable to begin walking
 5. None of the above ages are acceptable to begin walking
6. Complete evaluation of child's higher nervous system state is possible at the age of:
1. One year
 2. One month
 3. 7 years
 4. 20 years
7. Cerebrospinal fluid xanthochromia is physiological in:
1. Newborns
 2. Infants of first year of life
 3. Children of first years of life
 4. It is always pathological
8. Extremely high cytosis (up to $15 \cdot 10^9/l$) in a cerebrospinal fluid is a sign of:
1. Normo
 2. Meningism
 3. Serous meningitis
 4. Purulent meningitis

9. Pandy reaction reflects:

1. Protein quantity in cerebrospinal fluid
2. Leukocytes and lymphocytes quantity in CSF
3. Glucose level in CSF
4. Protein quantity in urine

10. "Sun set sign" is pathognomonic symptom of:

1. Cerebral palsy
2. Purulent meningitis
3. Microcephaly
4. Hydrocephaly

Correct answers: 1. 3; 2. 4; 3. 3; 4. 2; 5. 5; 6.3; 7.1; 8.4; 9.1; 10.4.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	SKIN AND SUBCUTANEOUS FAT
Course	3
Faculty	Medical №2

SKIN AND SUBCUTANEOUS FAT

Topic relevance. Due to its anatomic and physiological peculiarities children's skin and subcutaneous fat takes an active part in all exchange and immune processes, and are characterized by fast development in childhood. That is why skin and subcutaneous fat affections may be the evidences of an affected organism.

The aim of the lesson: to study the anatomic and physiological peculiarities of skin and subcutaneous fat of children of different age, with symptoms of affection.

Follow-up questions:

5. Anatomic and physiological peculiarities of skin and subcutaneous fat.
6. Skin and subcutaneous fat functions in age aspect.
7. Peculiarities of skin and subcutaneous fat of new-borns, physiological and transitory states of skin and subcutaneous fat within the new-born period.
8. Methods of skin and subcutaneous fat investigation.
9. Skin and subcutaneous fat affection semiotics.

Heaving covered the topic, the student should be able to:

1. Collect anamnesis, analyse the complaints typical of skin and subcutaneous fat affections.
2. Evaluate the skin colour, its humidity, temperature, skin fold thickness, skin elasticity, dermatographia, the state of capillaries; in case of eruption presence one must be able to find out its nature.
3. Evaluate the state of skin and subcutaneous fat (turgor, edemata, infiltration, the state of development).

Anatomic and physiologic peculiarities of skin in children

As far as it is known, skin consists of two main layers: epidermis and derma. Epidermis thickness in newborns and early aged children varies from 0.15 to 0.25 mm on different parts of the body comparing with 0.25 – 0.36 mm in adults. Among all epidermal layers the most peculiar are basal, granular and corneous ones. Basal layer in newborns is marked well and represented by two types of cells – basal and melanocytes. Melanin formation in melanocytes is not still enough; therefore skin in newborns may be more pale. In newborn Africans it has reddish color. Granular layer in infants is marked poorly and keratohyalin is absent, which explains transparency and pink color of skin during first months of life. Corneous layer in newborns is quite thin and consists of 2 – 3 rows of cornific cells, however its structure is more crumbly and contains more water, which creates an impression of its more expressed thickness. The margin between epidermis and derma is uneven; due to weak development of basal membrane separating them, epidermiolysis (detaching of epidermis from derma) may easily occur in different pathological states.

Skin surface of a newborn is covered with a secret with pH near to neutral (6.3 – 5.8). During first month of life it decreases to 3.8 improving bactericidal qualities of skin.

Derma in children consists of more cell elements and only to the age of 6 years it gets similar to adults structure, however, collagen fibers are still thin and elastic ones – too underdeveloped.

If to talk about peculiarities of skin functions in children, it is possible to mark the following:

Skin Glands in Age Aspect

Oil glands may be found on all skin surface, except for palms, feet, and dorsal side of feet. Their ducts open to hair follicles, except for lips skin, preputial bags and small lips of pudendum, where they open directly to the surface. Oil glands activity depends on androgenic stimulation (mother's androgen stimulation of fetus).

Apocrine glands are located in axillary creases, perianal and genitals districts, near umbilicus. They produce milk-like odourless secret. It is pushed out by androgen stimulators action to the surface. Under the influence of bacteria it becomes smelly, this smell is associated with perspiration. These glands are "sleeping" till the pubertal period.

Eccrine (merocrine) glands are spread over the body surface. They response to the temperature on hair districts and regulate body temperature by means of water transportation to the skin surface where it is turned into vapour. Their ducts are opened to the skin surface. The glands are provided with sympathetic nerve endings.

Skin investigation methods

Skin investigation supposes collecting the anamnesis, general inspection and palpation.

Anamnesis. In case of some pathological changes of skin finding out one needs to define: the time of their appearing, dynamics of their spreading over the skin, in which places the first elements were localized, how they were looking like, localization and symmetry of rash, its changing with the time, accompanying of elements development with temperature increase, contact with infectious patients, the same rash in the anamnesis, possible provoking factors.

General inspection

1. Color of skin. Possible changes: paleness (true and false one), cyanosis (local and generalized one), icterus (physiological icterus of newborns and pathologic one), hyperemia (physiological, developing under the influence of either high or low temperatures, in psychical excitement or mechanic irritation of skin, and pathologic); bronze color (adrenal glands chronic insufficiency).

2. Development of venous net (“caput medusae”, venous net dilatation on the head due to hydrocephaly, on the chest – in bronchopulmonal lymph nodes enlargement, vascular spiders in liver diseases, angiomas.

3. Hyperemia and maceration in skin folds – the so called intertrigo.

4. Umbilical region state should be thoroughly examined as far as being opened gates for possible contamination.

5. Morphologic elements of skin are external manifestation of processes taking place in skin. They are divided into primary and secondary ones.

Palpation of skin

With the help of palpation thickness of skin, its elasticity, moisture and temperature should be evaluated. Elasticity of skin is detected on back of the hand, anterior surface of the chest over ribs, in elbow bend. Skin moisture is evaluated by stroking of skin with doctor’s fingers on symmetric parts of the body. Normal skin is elastic, moderately moist and of normal temperature.

Additive methods of skin investigation also include dermographism estimation (its type, appearing and disappearing rate, sizes and elevation over the skin) and some special methods such as thermovision, puncture biopsy, lighting of damaged places with Vud’s lamp, etc.

Skin Eruption Elements

Primary: appear on visually unchanged skin. They are:

Spot (makula): primary non-cavernous skin eruption element which changes skin colour only, disappears when pressed. May be of inflammation and non-inflammation genesis. According to its size is divided into roseolas (less than 5 mm in size), proper spots and erythema (more than 20 mm in size). Among the spots of non- inflammation genesis hemorrhagic ones are the most frequent; they are divided into petechia, purpura (2-5 mm in size), linear (vibic- es), ecchymosis (“bruises” >5 mm), big formless spots - suggilla- tion, hematoma. The spots can be dypigmented (vitiligo, albinism), hyperpigmented (freckles, chloasma, birthmarks). Typhoid ma- culopapular rash is present in case of typhoid, syphilis, measles, and German measles. Punctate (finely papular) rash is typical of scarlet fever and measles. Telangiectasia (vessels units having a star form) are also treated as spots. They are the evidence of liver affection.

Papule (papula): a vessel knot, non-cavernous element which changes skin consistence and relief. Appears as a result of different pathological processes taking place in epidermis and upper skin layers (infiltrate skin accumulation, skin tissues hypertrophy, protein products precipitations). Depending on size the following types are distinguished: miliary, lenticular (up to 0.5 cm), numilar (1-2 cm). They may be of inflammation and non-inflammation (warts) genesis. Papule is most frequent in case of scab, lichen pilaris, measles, German measles, and purpura rheumatica.

Hunch (tuberculum): a non-cavernous element located in the reticular layer of derma, up to 1 cm in diameter, prominent on the skin surface. May be of inflammation and non-inflammation nature. Appears in case of syphilis, wolfish herpes, leprosy, and leishmaniasis.

Nodule (nodulus): a non-cavernous element located in derma. Maybe of non-inflammation (atheroma, lipoma) and inflammation (strophulus, leprosy, furuncle, carbuncle, erythema nodosum) genesis.

Vesicle (vesicula): a primary non-cavernous element having a bottom, cover, and content. If it is less than 1 cm in diameter, it is vial; if more than 1 cm in diameter, it is bulb (bulla). The content may be serum, hemorrhagic, and purulent. May be located either in epidermis or below epidermis. It is typical of eczema, chicken pox, shingles. The bulb is typical of burns.

Pustule (pustula): a non-cavity element with purulent content located in epidermis, derma or subcutaneous layer. May be connected (osteofolliculitis, folliculitis, acne, and hydradenitis) and disconnected (impetigo) with skin appendages; deep and superficial.

Bulb (urtica): a non-cavernous element (stands between cavernous and non-cavernous ones), forms as a result of temporary surface blood vessels widening and liquid blood components release. Examples: nettle rash, insects bites, nettle burns, allergic dermatosis.

Secondary: a stage of primary and secondary elements development.

Secondary pigmentation: skin colour change on the place of a previously existing element.

Peel (squama): an element consisting of surface epidermis layers, skin fat, dust, and bacteria.

Erosion (erosio): a defect in epithelium boundaries.

Ulcer (ulcus) is a deep defect of skin which reaches the cellular layer, is formed of deep primary elements.

Excoriation (excoriatio): *scratch, abrasion*. It is a linear skin defect caused in a mechanic way.

Crack (rhagades): a linear skin defect formed as a result of skin wholeness and elasticity damage.

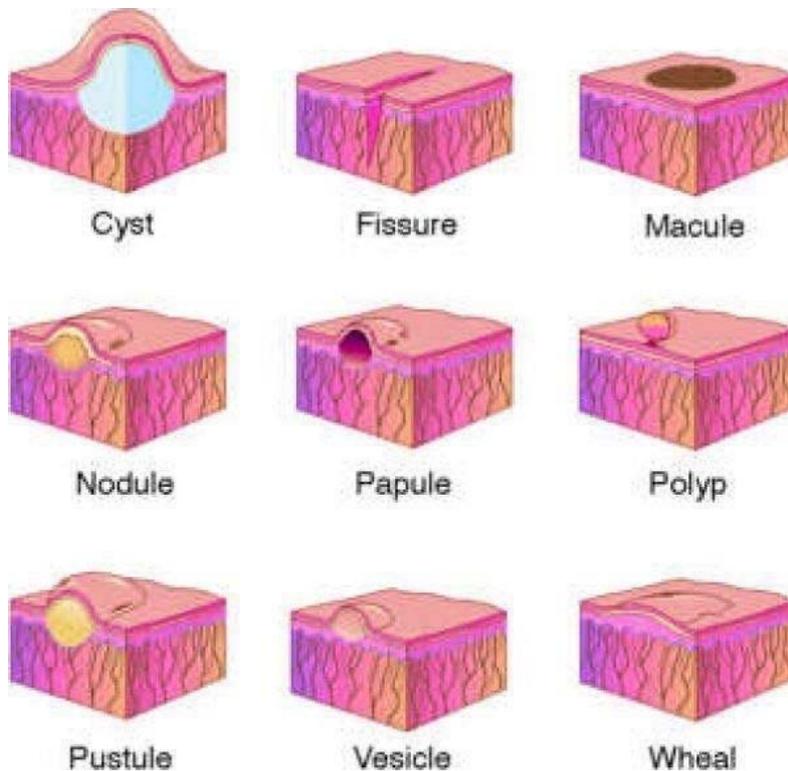
Crust (crustae): dry exudation; appears on places of all cavernous elements or on the places of secondary elements accompanied by skin wholeness affection.

Cicatrice (cicatrix): conjunctive tissue replaces skin.

Atrophy: all skin layers get thinner.

Lichenification (lichenificatio): all skin layers get thicker, the skin has a clear, intensive pattern (neurodermatitis, eczema). The skin is whole, coarse, the picture is enforced, there is a lot of furrows, practically cannot be folded.

The ambiguity of skin eruption elements is called *polymorphism*. The real (true) polymorphism is represented by several different primary elements, while the false one is represented by one primary element on different stages of its development.



Consider the lesion

Duration:

Onset - sudden versus gradual. Establish whether this is an acute presentation or an ongoing chronic problem.

- Previous episodes - eg, photodermatoses tend to recur every spring with the onset of good weather.
- Change - fluctuation versus persistence. Consider variation in severity - eg, occupational contact allergic dermatitis may improve when on holiday. Urticaria may be quite dynamic in its presentation but others are much more static.
- **Location** - as well as skin, remember mucous membranes. The site of lesions is important. Eczema tends to be on flexural surfaces (in adults and older children) whilst psoriasis tends to be on extensor parts. Lesions may have a specific distribution - around the genitals, in sweaty regions or sun-exposed areas. Establish whether the lesion has spread.

- **Provoking or relieving factors** - eg, heat and cold may be either aggravating or relieving factors, especially with urticaria; repeated drug exposures with fixed drug eruptions.
- **Associated symptoms:**
 - Itch - some lesions are renowned for being itchy and others for not being so but this can be misleading. Psoriasis is said to be non-itchy but there may be pruritus in the genital area.
 - Tenderness - inflammation is often tender.
 - Bleeding or discharge - bleeding may indicate malignancy and discharge may occur with an infected lesion.
 - Systemic symptoms - such as pyrexia, malaise, joint pain and swelling or weight loss. Some skin lesions are markers for underlying malignancy.
- **Response to treatment** - both patient and doctor initiated. A number of treatments may have been tried prior to consultation eg antiseptic lotions, calamine, antihistamines, over-the-counter (OTC) steroid or antifungal creams, herbal remedies or medication prescribed for another family member or friend. Complementary medicines such as chinese herbs may have unknown ingredients and potency. Partially treated lesions are the most difficult to diagnose.

Subcutaneous fatty tissue

Adipose tissue in child's organism, as far as in adult, fulfills different functions. Among them are mechanic protection, stabilization of inner organs, vessels and nerve truncuses, thermogenesis, thermoisolation, participation in body temperature homeostasis support and power inputs cover. Adipocytes participate in hormonally regulated hydrolysis and free fatty acids release. Fat cells may secrete some substances of signal nature which regulate functioning of hypothalamus and hypophysis. Besides, adipose tissue is of great importance for female sex hormones activation and takes part in puberty maturation in girls.

Adipose tissue formation is already marked from 14 – 20 weeks of gestation on limited parts of head and neck; later it is appearing on a trunk and later – on upper and lower extremities. The second trimester of pregnancy is considered to be critical one in adipose tissue forming. At the end of intrauterine development and during the first year of child's life fatty tissue growth is provided mainly by increasing of adipose cells number. However adipocytes enlargement in sizes is quite swift too. After 1 year these cells stop gaining their sizes and mass and the following fatty tissue increase is due to filling of already formed fatty cells pool with fat. Growing of fat cells in sizes and quantity goes on again in puberty.

The main peculiarity of subcutaneous fatty tissue in children is availability of brown adipose tissue in newborn period and during first months of life. Brown adipose

tissue is intensively differentiated and accumulated starting from 13 weeks of gestation. In mature newborn general quantity of brown adipose tissue makes about 1 – 3% of total body weight. It's largest clusters are placed on neck's back, around thyroid gland and thymus, in axillary region, supraileocecal zone and around kidneys. Its smaller parts are localized in intrascapular region, trapezius and deltoid muscles zones and around magistral vessels. The main function of brown adipose tissue noncontractile thermogenesis is, that is thermoproduction not connected with contraction of muscles. Brown adipose tissue storages may provide protection from moderate over cooling during 1 – 2 days. With the age this function of brown adipose tissue is significantly reduced. In children undergoing prolonged overcooling, it may completely disappear.

To the moment of birth subcutaneous adipose tissue is the most marked on face, extremities, chest and back. In this regions fatty layer reaches its maximal development to 6-th week of life whereas on the abdomen – to 4 – 6-th months. In case of disease its disappearing has an opposite direction: first of all from the abdomen, than – from extremities and trunk and at last term – from face.

Fatty tissue distribution type depends on sexual specificity. Its accumulation in boys tends to a visceral type (deposition of fat in the abdominal cavity, inside inner organs and in vessels' tunics). In girls fat deposition in lower segments of body, especially around the ties, prevails.

Tests

1. The following elements are treated as primary skin eruption elements except for:
 - 1.1. Spot.
 - 1.2. Papule.
 - 1.3. Vial.
 - 1.4. Hunch.
 - 1.5. Ulcer.
 - 1.6. Pustule.
2. The following elements are treated as secondary eruption elements except for:
 - 2.1. Cicatrice.
 - 2.2. Peel.
 - 2.3. Atrophy.
 - 2.4. Hunch.
 - 2.5. Lichenification.
3. Point out skin zones free of oil glands:
 - 3.1. Lips.

- 3.2. Palms.
 - 3.3. Neck.
 - 3.4. Shoulders.
 - 3.5. Stomach.
4. Which of the given below is not typical of children's skin epidermis?
- 4.1. Epidermis is thin, delicate, and light.
 - 4.2. Glittering epidermis layer is noticed on palms and feet only.
 - 4.3. Melanin pigment is absent in growth layer up to the age of 6 months.
 - 4.4. Cambial layer where epithelium cells growth takes place is almost undeveloped.
 - 4.5. All intercellular connections are very weak, that is why superficial layer cells are easily pilled and traumas are usual.
5. "Thrush" is the following:
- 5.1. A patch on a tonsil as a result of diphtheria.
 - 5.2. A white pellicle in the infant's mouth cavity left after feeding.
 - 5.3. A fungus affection of the mouth cavity, mostly among infants.
 - 5.4. White dots often appearing on infants' faces, a result of temporary oil glands ducts closing.
6. The following statements have nothing to do with children's derma peculiarities:
- 6.1. The quantity of collagenous (white) fibers is small; they are thin and joined into a light fascicle.
 - 6.2. Elastic derma fibres are well-developed; they are the pre- valing ones at young age.
 - 6.3. Papillary derma layer is not enough exposed.
 - 6.4. Water quantity in children's derma is sufficiently bigger than in adults'.
 - 6.5. Derma biochemical composition helps the increased skin penetration.
7. Which of the given below skin peculiarities helps the new-borns pemphigus development?
- 7.1. Collagenous (white) fibers are thin and joined into a light fascicle.
 - 7.2. Children's skin contains more water than that of adults.
 - 7.3. Children's skin is delicate and easily injured.
 - 7.4. The basic membrane is undeveloped.
 - 7.5. All given above.
8. Dermatographism is:
- 8.1. A corresponding skin vessels response to mechanic stimulation by a blunt item.
 - 8.2. A skin response to the environment temperature change.
 - 8.3. One of SCF characteristics.
 - 8.4. All given above.

9. Tweak syndrome positive reaction denotes:
 - 9.1. Increased skin vessels fragility.
 - 9.2. Periferal vessels hypotonia.
 - 9.3. Periferal vessels hypertonia.
 - 9.4. Lowered skin turgor.
 - 9.5. Physiological state of the new-born's skin.
10. The following substances are prevailing in children's skin:
 - 10.1. Crotonic and oleic acids.
 - 10.2. Stearic and arachidonic fat acids.
 - 10.3. Oleic and palmitic fat acids.
 - 10.4. Capric and linoleic fat acids.
 - 10.5. Palmitic and stearic fat acids.

Correct answers: 1.5; 2.4; 3.2; 4.4; 5.3; 6.2; 7.4; 8.1; 9.1; 10.3.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ _____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	MUSCULOSKELETAL SYSTEM
Course	3
Faculty	Medical №2

MUSCULOSKELETAL SYSTEM

Topic relevance. High growth and bone stock reconstruction tempo which take place while a lot of organs and systems are functionally imperfect, especially of children of young age, may lead in high frequency of apparatus affections.

The aim of the lesson: to study composition peculiarities and functions of bones and muscles of children of different age, to evaluate the state of this system and to recognize the most widespread symptoms of its affections in young age.

Follow-up questions:

1. Peculiarities of histological composition and chemical composition of children's bone tissue.
 2. Peculiarities of skull, backbone, chest, and extremities of children.
 3. The most frequent skeleton affections semiotics.
 4. The order of teeth coming out.
 5. Methods of bone system investigation.
6. Peculiarities of histological composition and muscles tonus of children of different age.
 7. Muscles affection semiotics of children.
 8. Methods of muscular system investigation.

Heaving covered the topic, the student should be able to:

1. Point out complaints typical of musculoskeletal system affection; collect the family and individual anamnesis.
2. Conduct an objective bones and muscles investigation of children of different age.
3. Evaluate the data obtained as a result of objective investigation of the given system.
4. Work out the plan for laboratory and instrumental musculoskeletal system investigation and evaluate the data obtained.

Muscular system investigation

Muscular system investigation starts from general inspection. Examining and after that palpating a certain groups of muscles it is necessary to compose an imagination about muscular mass. In healthy children muscles are elastic and equally developed on symmetric parts of the body. To a certain extent it is possible to judge about the development of muscles from the form of abdomen and position of a shoulder-blade.

General inspection allows to reveal muscular mass asymmetry – unequal degree of development of the same groups of muscles.

Muscular exhaustion in children is accompanied with muscular tonus decrease manifesting in abdomen enlargement, sharply marked lumbar lordosis, wing-shaped

shoulder-blades and disorders of carriage. Tonus of muscles is evaluated by palpation. Different groups of muscles are palpated one by one passively flexing and extending extremities. Flabbiness of muscles testifies to their hypotonus; tension and density of muscles testify to muscular hypertonus. For evaluation of muscular tonus in newborns “return” and “traction” tests are carried out.

Passive movements investigation include flexing and extending of extremities, spinal column, etc. In newborns and children of first 4 months of life limitation of movements in joints is marked and is connected with physiological muscular hypertonus.

Active movements investigation is carried out by observing the child doing different kinds of activities. The child also may be asked to rise, flex and extend hands, sit down, stand up and walk.

Muscular strength investigation is of great diagnostic importance in muscular system evaluation. It is possible to do by trying to take off a toy from the child’s hands in younger children; elder children are asked to make resistance when a doctor tries to extend an extremity. Conclusion about muscular strength may be also composed on the basis of observing the child getting up from a pot, chair, floor, walking, stepping over, going upstairs and downstairs, walking on heels or tiptoes, holding hands on a head, etc.

Skeletal system

Investigation methodic

Main complains: pains in bones and joints, changing of joints’ configuration, limitation of movements. It is necessary to specify localization of pains, symmetry of the damage, character and intensity of pain, conditions of its appearance, duration, periodicity and permanency. It is also needed to find out factors contributing to pain relief. Forms of movements’ limitation should be thoroughly analyzed. Connection of manifestation of the disease with some previous episodes of infectious processes is of great diagnostic value. General notion about bone tissue development may be created by collecting such anamnestic data as temps of growth, age of fontanel closing, teeth eruption terms, etc.

General inspection includes evaluation of:

- Form of the head (presence of any deformities, protruding tubers, flattening of skull, etc);
- Sizes of the head (macrocephaly, microcephaly);
- Comparative evaluation of upper and lower face (this correlation reflects the level of biological maturation of a child);
- Form of the chest

- Epigastric angle size (it helps to evaluate constitution of a child: hypersthenic, asthenic and normosthenic ones);
- Posture violations (it is necessary to differ violation of posture from spinal column true deformations; posture violation may be easily corrected after doctor's or mother's ask);
- Spinal column (is evaluated in vertical position of a patient and necessarily in trunk position bending forwards);
- Upper extremities (attention should be paid on the length of shoulder, forearm and arm, pathological changes of joints)
- Lower extremities (symmetry of gluteal folds, quantity of folds on inner surface of hips, legs shortening, X- or O-shaped deformations, flat-footedness (platypodia), pathological changes of joints).

Palpation consists of:

- Palpation of the head (evaluation of skull bones density, state of sutures and fontanelles)
- Palpation of ribs
- Palpation of extremities bones
- Palpation of joints (evaluation of their form, sizes, color of skin over them, local increasing of temperature, deformations)
- Examination of a newborn for congenital hip dislocation

Additive diagnostic methods of bone tissue evaluation include:

- Roentgenologic(al) investigation (may be helpful in finding out of different deformities of bones, osteoporosis signs, number of ossification points)
- Computer tomography
- Nuclear magnetic resonance
- Densitometry
- Ultrasound investigation
- Laboratory tests: Ca and P levels in blood serum and urine, alkaline phosphatase level in blood serum, oxiprolin levels in blood serum and urine.

Signs and symptoms of rickets include:

- Bone tenderness
- Dental problems
- Muscle weakness (rickety myopathy)
- Increased tendency for fractures (easily broken bones), especially greenstick fractures
- Skeletal deformity

- Toddlers: Bowed legs and double malleoli (genu varum)
- Older children: Knock-knees (genu valgum) or "windswept knees"
- Cranial deformity (such as skull bossing or delayed fontanelle closure)
- Pelvic deformity
- Pectus carinatum ("pigeon chest")
- Spinal deformity (such as kyphoscoliosis or lumbar lordosis)
- Growth disturbance
- Hypocalcemia (low level of calcium in the blood)
- Tetany (uncontrolled muscle spasms all over the body)
- Craniotabes (soft skull)
- Costochondral swelling (aka "rickety rosary" or "rachitic rosary")
- Harrison's groove
- Double malleoli sign due to metaphyseal hyperplasia
- Widening of wrist raises early suspicion, it is due to metaphyseal cartilage hyperplasia.

Tests

1. The big parietal region of a healthy child is closed at the age of:
 - 1.1. 4-6 months.
 - 1.2. 6-8 months.
 - 1.3. 9-11 months.
 - 1.4. 1-1.5 years.
2. The newborn's chest is of the following form:
 - 2.1. Cylindrical.
 - 2.2. Barrel.
 - 2.3. Funnel.
 - 2.4. Conical.
3. Which of the given below symptoms is not a rickets' one?
 - 3.1. Craniotabes.
 - 3.2. Crown sides pliability.
 - 3.3. Rachitic rosaries.
 - 3.4. Bandy (boomerang) legs.
4. Which of the given below signs is not an evidence of osteomalacia?
 - 4.1. Craniotabes.
 - 4.2. Caput quadratum.
 - 4.3. Genu varum.
 - 4.4. Back of the head's flattening.
5. Which of the given below symptoms is not a sign of osteoid tissue hyperplasia?

- 5.1. Rachitic rosaries.
- 5.2. Rickety thickening of wrists and ankles.
- 5.3. Harrison's trench.
- 5.4. Frontal tubers enlargement.
6. Flat feet is a physiological state of children up to the age of:
 - 6.1. 6 months
 - 6.2. First 2-3 years of life. 6.3.5 years.
 - 6.4. 7 years.
7. Physiological chest kyphosis is formed by the age of:
 - 7.1. 2-3 months.
 - 7.2. 6-7 months.
 - 7.3. 10-12 months.
 - 7.4. 1.5-2 years.
8. The flexors hypertonus of the upper extremities is preserved among children up to the age of:
 - 8.1. 1 month.
 - 8.2. 2-3 months.
 - 8.3. 3-4 months.
 - 8.4. 4-5 months.
9. The flexors hypertonus of the lower extremities disappears at the age of:
 - 9.1. 1 month.
 - 9.2. 2-3 months.
 - 9.3. 3-4 months.
 - 9.4. 4-5 months.
10. Which of the given below additional methods is used for muscular system investigation?
 - 10.1. Electromyography.
 - 10.2. Chronaximetry.
 - 10.3. Dynamometry.
 - 10.4. Scanning.

Correct answers: 1.4; 2.2; 3.4; 4.2; 5.3; 6.2; 7.2; 8.2; 9.3; 10.4.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S RESPIRATORY SYSTEM. THE METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S RESPIRATORY SYSTEM. THE METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS

Topic relevance. The respiratory system is one of those which are intensively developed morphologically and functionally in the post-natal period. Anatomic and physiological peculiarities of children's respiratory organs determine the peculiarities of respiratory pathology which takes one of the leading positions in the list of children's morbidity structure.

The aim of the lesson: to study anatomic and physiological peculiarities of all the sections of the respiratory system, to master the methods of children examination, to study affection semiotics.

Follow-up questions:

1. Anatomic and physiological peculiarities of the respiratory system and gaseous exchange in children.
2. Additional methods of children's respiratory organs examination:
 - functional (spirometry, pneumotachometry, peakflowmetry, oxymetry);
 - laboratory (general and biochemical blood analysis, nose and throat secretion investigation, pleural fluid, biopsy materials examination);
 - instrumental (X-ray methods of chest organs investigations, computer and unenhanced (baseline) magnetic resonance imaging, thermography, bronchoscopy and bronchography, scanning);
 - allergy diagnostics methods.
3. Respiratory system affection semiotics in children.

Having covered the topic, the student should be able to:

1. Denote complaints typical of respiratory organs affection, collect anamnesis.
2. Conduct objective investigation of respiratory organs and evaluate the obtained results for children of different age.
3. Define and interpret symptoms and syndromes of the children's respiratory system affection.
4. Make up a plan of investigation of a child with affected respiratory system.

Anatomic and Physiological Peculiarities of the Respiratory Organs of Children

Respiratory organs are divided into three sections: upper (nose, gullet), middle (larynx, trachea, bronchi), and low (bronchioles, alveoles). Before the moment of birth their morphological composition is not perfect which estimates functional peculiarities of respiration. The respiratory organs formation finishes till the age of 7, at older age

their size is the only thing which changes. All the respiratory organs have noticeably smaller size and thinner lumen in comparison with those of adults. Mucous tunic is delicate, thin and easily damaged. Glands are not well-developed, production of IgA and surfactant is not sufficient. The submucous layer is soft, contains insufficient quantity of elastic and connective tissue elements, and is multi-vascularized. Cartilaginous frame of respiratory tracts is soft and pliable. It leads in the reduction of the mucous barrier function, easier infectious and atopic penetration into blood vessels, in the respiratory tracts narrowing resulted by edemas development.

Nose and nasopharynx cavities of children of early age are of small size, nasal meatus is narrow, turbinate (concha nasalis) is thick (lower ones develop up to 4 years), that is why even insignificant hyperemia and mucous edema make nasal meatus impassable, leading in asphyxia and complicating sucking.

To the moment of birth *maxillary sinuses* are the only developed ones of the accessory nasal sinuses (complete development finishes up to 7 years). One ethmoidal, one sphenoidal and two frontal sinuses finish their development up to the age of 12, 15, and 20 years accordingly.

Nasolacrimal canal is short, situated by the angle of eye; at the same time, its valves are not well-developed, which allows infection to move easily from nose to conjunctival sac (saccus conjunctivae).

Pharynx is relatively broad and small. Auditory (otopharyngeal, eustachian) tubes, which connect epipharynx and tympanic cavity are short, broad, straight, and located horizontally. It allows infection to penetrate from nose to middle ear (auris media). Lymphoid ring of Woldajer-Pyrohov set in pharynx contains six tonsils: two palatine tonsils, two tonsils of torus tubaris, one lingual (glossal) tonsil, and one nasopharynx tonsil. During the oropharyngeal surface investigation the term "fauces" is used. Higher stands for the anatomic unit surrounded by the root of the tongue from below palatine tonsils and arches from left and right, by the soft palate and uvula from above, by the back side of oropharynx from the rear and by the mouth cavity from the front. Epiglottis of newborns is relatively short and broad and may be the reason for the pharynx entrance functional constriction and glottic spasms appearance.

The larynx of children is located higher and is longer than that of adults, and has a watering-can form with distinct constriction in the subglottic zone (4 mm for newborns), which gradually spreads (1 cm long at the age of 14). Glottis is narrow; its muscles get tired quickly. Vocal cords are thick, short; mucous tunic is very delicate and much vascularized, rich in lymphoid tissue; all mentioned above leads in subglottis edema in case of respiratory infection and croup syndrome.

Trachea is broad of relatively big length, watering-can form, contains 15-20 cartilaginous rings and is very movable. Trachea's walls are soft. Mucous tunic is delicate, dry, and well-vascularized.

Bronchial tree (arbor bronchialis) is formed before the child's birth. Bronchi size enlarges intensively during the first year of life and in teenage period. Cartilaginous rings are their base; they do not have covering laminae joined by a fibrous septum. Bronchi cartilages are very elastic, soft and are easily moved. Children's bronchi are relatively broad; the right main bronchus is the continuation of trachea, which causes foreign bodies easy coming to it. Absolute narrow shape is typical of small bronchi; it is the reason for obstructive syndrome quite often development at this age. Mucous tunic of big bronchi is covered by epithelium which performs the bronchi clearing function (mucociliary clearance). The vagus nerve (nervus vagus) incomplete myelination and respiratory muscles undeveloped state result in the absence of cough reflex or very weak coughs in small children. The slime accumulated in small bronchi easily corks them and leads in pulmonary collapses and pulmonary tissue contamination.

The children's *lungs* have segmental structure as well as those of adults. The segments are divided by thin connective tissue septa. The main structural lungs unit is acinus, but its terminal bronchiole finishes with alveolar saccules which are different from adults'; new alveoli are formed gradually from these saccules, the quantity of alveoli is three times less than that of adults. The diameter of each alveolar increases with the age of a child. At the same time the vital volume of lungs enlarges. Interstitial tissue of lungs is fluffy, rich in vessels, cellular tissue, contains a small quantity of connective tissues and elastic fibers. As a result of it, the pulmonary tissue of children of the first years of life is more saturated by blood, and is less air conductive. Undeveloped elastic skeleton leads in emphysema and pulmonary collapse. Inclination to pulmonary collapses is also a result of the lack of surfactant, a substance which regulates alveolar surface tension and stabilizes air carrying terminal spaces, i.e., alveoli. Surfactant is synthesized by alveolocytes of second type and appears when the fetus weight is not less than 500—1000 gr. The smaller the gestational age of a child is, the greater the lack of surfactant is. It is the lack of surfactant which is the cause of incomplete lungs spread among prematurely born children and the respiratory distress syndrome appearance.

The main functional physiological peculiarities of respiratory organs of children are the following: breathing is frequent (compensates the lungs small volume) and superficial. The younger a child is, the more frequent breathing is (physiological shortness of breath). Newborn breath makes 40—50 times per minute, 1-year-old children - 35—30 times per minute, 3-years-old children - 30—25 times per minute,

7-years-old children - 20—25 times per minute, 12-years- old children - 20—18 times per minute, and adults - 12-14 times per minute. Speeding-up and slowing-down of breathing is noted if deviation makes 30—40 and more percents from the normal rate. Newborns' breathing is characterized by arrhythmic character with short stops (apnoea). Diaphragmatic character of breathing is prevailing one, beginning with the age of 1—2 it becomes a mixed one, at the age of 7—8 it becomes a breast one among girls and a stomach one among boys. The younger a child is, the less the lungs breathing volume (LBV) is. Breathing volume per minute (BVM) increases in accordance with a child's age. Thus, infants' BVM is 2—3 times bigger than that of adults. The lungs vital volume (LVV) of children is significantly lower than that of adults. The gas exchange of children is more intensive due to the significant lungs vascularization, blood circulation speed, and high diffusion capacity.

Upper respiratory system

The upper respiratory system includes the nose, mouth, sinuses, and throat. When you have an upper respiratory infection, you may feel uncomfortable, have a stuffy nose, and sound very congested. Other symptoms of an upper respiratory infection include:

- Facial pain or pressure.
- A runny or stuffy nose, which may lead to blockage of the nasal passages and cause you to breathe through your mouth.
- A sore throat.
- Laryngitis.
- Irritability, restlessness, poor appetite, and decreased activity level.
- Coughing, especially when lying down.
- Fever that occurs suddenly and may reach 103°F (39°C) or higher.

Lower respiratory system

The lower respiratory system includes the bronchial tubes and lungs. Respiratory problems are less common in the lower respiratory system than upper respiratory system.

The symptoms of a lower respiratory (bronchial tubes and lungs) problem usually are more severe than symptoms of an upper respiratory (mouth, nose, sinuses, and throat) problem.

Symptoms of lower respiratory system infections include:

- Cough, which continues throughout the day and night, often producing green, yellow, brown, or gray mucus (sputum) from the lungs.
- Fever, which may be high with some lower respiratory system infections such as pneumonia.
- Difficulty breathing. You may notice:
 - Shortness of breath.
 - Grunting, which is heard during the breathing out (exhaling) phase of breathing.
 - Wheezing.
 - Flaring the nostrils and using the neck, chest, and abdominal muscles to breathe, causing a "sucking in" between or under the ribs (retractions).
- Chest pain with exertion or when you take a deep breath.

Tests

1. Which of the given below is not peculiar of the nose mucous tunic of children?
 - 1.1. Covered with delicate epithelium.
 - 1.2. Thin, tender, dry.
 - 1.3. Submucosal layer is well-vascularized.
 - 1.4. Cavernous tissue is well-developed.
 - 1.5. Dry.
2. When do all the paranasal sinuses finish their formation?
 - 2.1. During the 3rd-6th months of pre-natal development.
 - 2.2. They are formed when a child is born.
 - 2.3. Till the 3rd year of life.
 - 2.4. Up to 10 years.
 - 2.5. Up to 15-20 years.
3. What peculiarities are not typical of the larynx of early age children?
 - 3.1. Watering-can-like form.
 - 3.2. The fissure of glottis is broad with developed vocal folds.
 - 3.3. Cartilages are pliable and soft.
 - 3.4. Short and narrow.
 - 3.5. Well-vascularized submucous layer.
4. What peculiarities does trachea of children of early age have?
 - 4.1. Short and narrow.
 - 4.2. Mucous tunic is delicate, thin, dry, and much vascularized.
 - 4.3. The quantity of semi-rings enlarges with age.
 - 4.4. Is located lower than that of adults.
 - 4.5. The bifurcation place is located on the level of the VII cervical vertebra.

5. What is the newborn's respiratory frequency per minute?

5.1. 16-18.

5.2. 25-30.

5.3. 35-40. 5.4.40-60. 5.5. 50-70.

6. When does children respiratory organs formation finish?

6.1. Up to 1 year.

6.2. Up to 3 years.

6.3. Up to 7 years.

6.4. Up to 10 years.

6.5. Up to 15 years.

7. Voice trembling is enforced during:

7.1. Pneumonia.

7.2. Exsudative pleurisy.

7.3. Bronchial asthma.

7.4. Pneumatothorax.

7.5. Emphysema.

8. Local weakening of percutory sound may be found:

8.1. If a child is healthy.

8.2. If a child is ill with pneumonia.

8.3. If a child is ill with bronchitis.

8.4. If a child is ill with emphysema.

8.5. If a child is ill with bronchiolitis.

9. Crepitation appears as a result of:

9.1. Bronchitis.

9.2. Pneumonia.

9.3. Pulmonary collapse.

9.4. Bronchial asthma.

9.5. Dry pleurisy.

10. When can the puerile respiration be heard?

10.1. When a child is newborn.

10.2. When a child is of early age.

10.3. At the age of 7-8 years.

10.4. At the age of 10-14 years.

Correct answers: **1.4; 2.4; 3.1; 3.2; 4.2; 5.4; 6.3; 7.1; 7.2; 8.4; 8.5; 9.2; 10.3.**

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Ministry of Health of Ukraine
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“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ _____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S CARDIOVASCULAR SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S CARDIOVASCULAR SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS

Topic relevance. The cardiovascular system is one of the vitally important in a child's organism. The cardiovascular system provides oxygen and nutritive material supply to all organs and tissues, carbonic acid and other metabolism's rests evacuation, thus taking part in internal environment continuity maintaining. The cardiovascular system of children of different age has a lot of peculiarities which influence its functioning. It determines the necessity of anatomic and physiological peculiarities of children's cardiovascular system studying by students of medical departments.

The aim of the lesson: to study anatomic and physiological peculiarities of the children's cardiovascular system characteristic in different stages of ontogenetic development, to be able to investigate the cardiovascular system of children of different age, to know the most important symptoms of cardiovascular disorders among children.

Follow-up questions:

1. Peculiarities of fetus' and newborn's blood circulation.
2. Anatomic peculiarities of heart among children of different age.
 3. Peculiarities of heart tomography in age aspect.
 4. Histological peculiarities of child's myocardium.
 5. Peculiarities of child's heart intervals and rhythm.
6. Morphological peculiarities of vessels (arteries, veins, capillaries).
7. The frequency of heart contractions in children of different age.
 8. Children's arterial pressure at different age.
9. Differential diagnostics of functional and organic systolic murmur, physiological and pathological splitting of the II tone on the children's lung artery.
10. Positive features of physiological peculiarities of the children's cardiovascular system.
11. Negative features of physiological peculiarities of the children's cardiovascular system.

Having covered the topic, the student should be able to:

1. Investigate the cardiovascular system in children.
2. Collect anamnesis among children of different age, taking into account typical complaints about the cardiovascular system of young and older patients.
3. Conduct the children's heart percussion, estimating age dictated heart boundaries.
4. Conduct heart auscultation among children using the knowledge of age peculiarities.

5. Evaluate the results of the main instrumental methods of cardiovascular system investigation among children.

Anatomic and physiologic peculiarities

Immediately after the birth the following changes take a place:

- Pulmonary respiration functioning start. This significantly reduces resistance of blood circulation through the capillaries of lungs and 5 times increases blood circulation through the lungs.

- Lesser circulation switching on results in substantial increase of pressure in the left atrium leading in pressing of septum to the edge of foramen ovale and terminating blood shunt from the right atrium to the left one.

- Botallo's duct spasm. Functional closing of this fetal communication occurs on the first day of life (during first 24 hours in average) and anatomic closing usually takes a place up to the end of the 2-nd month of life.

Approximately by 2-nd – 6-th months of infant's life intrauterine blood circulation vessels get reduced and obliterated. However in some children and even adults foramen ovale remains open. But as far as this opening is too small to change the haemodynamics, it is of no clinical importance and doesn't influence child's life.

Cardiovascular system after the birth of a child has the following peculiarities:

- From the anatomic point of view the newborn's heart is located more cranially because of the diaphragm high position.

- The heart volume is significantly bigger than that of the chest.

- The heart is globe-shaped.

- The right and left ventricles are relatively equal.

- The left heart ventricle grows intensively after birth due to the increase of vessel resistance and arterial pressure.

- Arterial vessels grow faster than those of the heart.

- Newborns' correlation between the pulmonary artery diameter and that of aorta is different (aorta is 16 mm, pulmonary artery - 21 mm), at the age of 10-12 their diameter becomes equal; adults' aorta is always bigger than pulmonary artery (aorta is 80 mm, pulmonary artery - 74 mm).

- Blood vessels of newborns have thin walls, their muscular tissue and elastic fibres are well developed.

- Children's capillaries are well-developed, relatively broad and short.

- Children's pulse is more frequent for all age categories in comparison with adults due to more intensive metabolism and later vagal interval heart development.

- The arterial pressure of children is lower than that of adults. The following formula may be used for precise calculations of the arterial pressure of children older than 1 year (mm of mercury): the average age pressure = systolic pressure - 90 + 2n, diastolic pressure - 60 + 2n, where *n* stands for the child's age in years.

Clinical examination

Complains. The most typical complains of children with cardiovascular diseases are flabbiness, rapid fatigability in physical load (walking, games, riding a bicycle, going upstairs, etc). As a rule a child stops playing and asks to take him in arms. An infant stops sucking the breast, breaths hardly and frequently, then takes it again and after few sucking movements leaves it again.

Dyspnea, fatigability, bad appetite, body weight loss and growth retardation are the most typical signs of circulatory deficiency in children. Repeated and prolonged bronchopulmonary diseases connected with lesser circulation overflowing marked in many congenital heart defects are character too.

Children with heart rhythm disorders may suddenly lose consciousness, stop breathing and become conscious again several seconds after. In time of paroxysmal tachycardia attacks a child gets anxious, develops dyspnea and sometimes vomiting. He is covered with a cold sweat. An attack stops suddenly.

Elder children may complain of pains in heart region. Usually these pains are caused by changes of a vessel tonus (hypotension or hypertension) and don't have such an acute character and high intensity like in adults. Rarely, they develop in inflammatory processes of heart, its tunics or vessels.

Among other complaints being a reason for visiting a doctor paleness or cyanosis of skin, pains in joints, edemas on the legs or other parts of the body are.

While working with *anamnesis* doctor should find out the time of first manifestations of the disease and further dynamics of symptoms, possible reason or provoking factor of the disease, results of diagnostic investigations (if they were carried out) and the diagnosis of the disease (if the child was already treated). Also it is important to find out peculiarities of treatment and its effectiveness.

Anamnesis vitae may give information about the course of pregnancy (as far as some pathological states of a pregnant woman may lead in cardiovascular problems in fetus), focuses of chronic infection, allergy, stresses, physical and psycho-emotional overloads, heart diseases in family members, etc.

General inspection

During general inspection of patient with cardiovascular pathology particular attention should be paid on:

- Consciousness and position in the bed (active, passive or forced)
- Physical development and its proportionality

- Color of skin (paleness, cyanosis)
- “Clubbing” and “Watch glasses” symptoms
- Cardiac edemas (characteristic peculiarities of cardiac edemas are: developing at the end of day or after physical work on legs first and spreading in ascending direction with progressing of main pathologic process; accompanying cyanotic color of skin; dense consistence)
 - Apex beat (heart apex thrust against small area of thoracic wall in each systole): is visualized like a weak pulsation in heart region in almost all children.
 - Cardiac thrust (pulsation of large area of thorax going abroad the heart region caused by pushing of the chest’s wall by largest part of heart): shouldn’t be detected normally.
 - Peripheral veins pulsation (carotid arteries pulsation – “dancing carotids”, Musset’s sign; positive venous pulse; epigastric pulsation)

Palpation. Palpation supplements and specifies the received in general inspection data.

- *Pulse rate evaluation.*
- *Apex beat evaluation.*
- *Latent edemas detection.*

Relative Heart Dullness borders in Children of Different Age

B oundary	Age groups		
	Up to 2 years	2-7 years	7-12 years
U pper	II rib	II intercostal space	Upper edge of the III rib
R ight	2 cm out of lin. sternalis dextra	1 cm out of lin. sternalis dextra	0.5 cm out of lin. sternalis dextra
L eft	2 cm out of lin. medioclavicularis sin	1cm out of lin. medioclavicularis sin	0.5 cm out of lin. medioclavicularis sin

Auscultation

The aortic area, pulmonic area, tricuspid area and mitral area are areas on the surface of the chest where the heart is auscultated. Heart sounds result from reverberation within the blood associated with the sudden block of flow reversal by the valves closing. Because of this, auscultation to determine function of a valve is usually not performed at the position of the valve, but at the position to where the sound waves reverberate.

Aortic valve (to aorta)	right second intercostal space	upper right sternal border
Pulmonary valve (to pulmonary trunk)	left second intercostal space	upper left sternal border
Erb's point	Left third intercostal space	left sternal border
Tricuspid valve (to right ventricle)	left fourth, fifth intercostal spaces	lower left sternal border
Mitral valve (to left ventricle)	left fifth intercostal space	left midclavicular line

Organic murmurs. Each heart defect has its characteristic features. They are:

- Mitral insufficiency: systolic (may occupy the whole systole) blowing murmur on heart apex auscultated immediately after weakened I sound irradiating into left axillary region and sometimes to the back (under the blade-bone angle)
- Mitral stenosis: diastolic roaring murmur on the background of intensified flapping I sound which is better auscultated in position of the child on a left side
- Aortal valve insufficiency: silent and tender protodiastolic murmur with maximum in V point
- Aortal stenosis: rude systolic murmur auscultated over the whole heart region and irradiating to *fossa jugularis* region and back
- Tricuspid valve insufficiency: quite loud systolic murmur better auscultated in the lower third of sternum and irradiating upwards and rightwards
- Tricuspid stenosis: not rude presystolic murmur better auscultated in position of the child on the right side and combined with flapping I sound over lower third of sternum.

Murmurs in pericarditis are auscultated in both phases (systole and diastole) and are better heard near the sternum.

Additive methods of examination:

- Functional tests
- ECG

- Ultrasound cardiography
- Daily heart monitoring
- Phonocardiography
- Dopplerography

Tests

1. Atria develop faster than heart ventricles concerning height and differentiation at the age of:
 - 1.1. Up to 2 years.
 - 1.2. 2-10 years.
 - 1.3. After 10 years.
2. Point out the wrong statement concerning histologic peculiarities of children's myocardium:
 - 2.1. Muscle fiber is thin, widespread but close.
 - 2.2. Transverse striate is well-disposed.
 - 2.3. Multinucleated myocardiocytes are characteristic.
 - 2.4. Connective and elastic tissues are developed badly.
3. The heart is affected by the following factors at early child's age:
 - 3.1. Parasympathetic district of the vegetative nervous system.
 - 3.2. Sympathetic district of the vegetative nervous system.
 - 3.3. Parasympathetic and sympathetic districts of the vegetative nervous system equally take part in heart intervention.
4. The frequency of heart beat during the first year of life is (beats per minute):
 - 4.1. 140-160.
 - 4.2. 120-130.
 - 4.3. 110-120.
 - 4.4. 90-100.
 - 4.5. 70-80.
5. The frequency of heart beat during the fifth year of life is (beats per minute):
 - 5.1. 140-160.
 - 5.2. 120-130.
 - 5.3. 110-120.
 - 5.4. 90-100.
 - 5.5. 70-80.
6. The upper border of the newborn's heart reaches:
 - 6.1. III intercostal.
 - 6.2. III rib.
 - 6.3. II intercostal.
 - 6.4. II rib.

7. The following is typical of the capillaries of children of young age:
 - 7.1. They are well-developed, relatively broad, short, and wavy.
 - 7.2. Low ability of penetration of capillaries' walls.
 - 7.3. High speed of blood circulation in capillaries.
 - 7.4. The wall is dense; muscular fibers are well-developed.
8. The systolic blood pressure of a 1-year-old child is (mm of mercury):
 - 8.1. 70-76.
 - 8.2. 80-90.
 - 8.3. 100-110.
 - 8.4. 120-130.
9. The systolic blood pressure of a 5-year-old child is (mm of mercury):
 - 9.1. 70-76.
 - 9.2. 80-90.
 - 9.3. 90-100.
 - 9.4. 100-110.
 - 9.5. 110-120.
10. The left boundary of the heart of a 1-year-old child is determined:
 - 10.2. 1-2 cm outside the left middle collarbone line.
 - 10.3. On the left middle collar bone line.
 - 10.4. 1-2 cm inside the middle collar bone line.

Correct answers: 1.1; 2.2; 3.2; 4.2; 5.4; 6.4; 7.1; 8.2; 9.3; 10.1.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
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“ _____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S DIGESTIVE SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S DIGESTIVE SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS

Topic relevance. The children's digestive organs have certain anatomical and physiological peculiarities which presuppose peculiarities of alimentation as well as pathology peculiarities of this system; moreover, this system takes one of the leading positions in infants' and older age children's morbidity. A doctor has to know these peculiarities as well as the peculiarities of gradual ripening of the digestive system for working out the ration, diagnostics, treatment and prevention of morbidity connected with organs of digestion of children of different age.

The aim of the lesson: to study age-related anatomic and physiological peculiarities of all the parts of the digestive system, to master the methods of children's examination, to study the semiotics of this system's diseases.

Follow-up questions:

1. Anatomic and physiological peculiarities of the children's oral cavity.
2. Anatomic peculiarities of esophagus, stomach, bowels, mucous membrane of digestive apparatus, liver, gallbladder and the digestive system sphincter apparatus.
3. Peculiarities of the secretory function of the digestive system:
 - a) acidity, enzymatic activity of gastric (appetite) juice;
 - b) external and internal secretory functions of the abdominal salivary gland;
 - c) bile quantitative and qualitative composition;
 - d) secretory function of bowels;
 - e) correlation between the digestive tract secretory activity, the character of feeding, and the child's age.
4. Peculiarities of alimentary ingredients (proteins, fats, carbohydrates, mineral salts, and water absorption) through different sections of the nutrient canal (canalis nutricius).
5. Peculiarities of the evacuation function of the nutrient canal of children of early age:
 - a) evacuation of food from the stomach depending on feeding;
 - b) the frequency of defecation (bowel movement) and its dependence on feeding.
6. Variants of defecation most frequently found among children:
 - a) newly-borns and infants during natural and artificial feeding;
 - b) gastric indigestional;
 - c) during enteritis and colitis.
7. Bowels microflora and its role in the child's organism:

- a) the large intestine microflora character;
- b) the dependence of microflora on feeding;
- c) physiological role of microflora;
- d) pathological role of microflora, the notion of dysbacteriosis.

8. Symptoms and syndromes most frequently observed during digestive organs diseases: the pain syndrome, its peculiarities and manifestations among children; the syndrome of dyspepsia (stomach and bowels one); reduction or absence of appetite; regurgitation and vomiting; defecations disorders; hepatosplenomegaly (hepatolienal syndrome), etc.

9. The reasons of digestive organs diseases.

10. Laboratory and instrumental methods of digestive organs investigation:

- a) fractional investigation of gastric juice;
- b) duodenal intubation;
- c) endoscopic methods of examination;
- d) ultrasound methods of investigation;
- e) X-ray and radiometric methods;
- f) biochemical, immunological, bacterioscopic and bacteriological methods of investigation.

Having covered the topic, the student should be able to:

1. Collect anamnesis of a child and its parents, paying attention to the way of feeding, its composition and regime, preference given to different dishes, the state of appetite, hereditary tendency to digestive organs diseases; typical complaints.
2. Conduct objective investigation of digestion organs of children of different age (examination, percussion, palpation, auscultation).
3. Prescribe necessary laboratory and instrumental methods of investigation and evaluate the obtained results.
4. Denote the most frequent symptoms and syndromes of digestive system's affections among children.

Anatomic and Physiological Peculiarities of the Children's Digestive System

All the sections of the infants' digestive system are adapted to the natural feeding by mother's milk. The mouth cavity of a child is relatively small, the tongue is relatively big, and the palate is flattened during the first year of life. Well-exposed adipose bodies of cheeks, roller-like bulges on gums, and cross tucks on the lips mucous tunic have a great importance for sucking. The mucous tunic of the mouth cavity is a bit dry, rich in blood vessels, and very sensitive. Saliva secretion is provided by the submandibular gland (*glandula submandibularis*), sublingual gland (*glandula sublingualis*), parotid

gland (glandula parotidea), and numerous small glands. Within the first 3 months saliva secretion is not significant, but besides it the carbohydrates digestion and milk casein coagulation in the mouth cavity start. The esophagus has a watering-can-like form, its length makes a half of the newly-born's body (10 cm), and it has the length of 25 cm among teenagers. The newly-born's stomach is round, its capacity makes 30—35 ml, at the age of 7-11 its form is similar to that of adults', its capacity enlarges up to 1020 ml. The movable function of the stomach lies in peristaltic movements with periodic clonuses and funnel openings.

Acidity and enzymes activity of stomach glands is low, but 1/3 of fat (emulsified by milk lipase) is hydrolysed in stomach under the influence of stomach lipase. Protein is partially hydrolysed in stomach due to such proteolytic enzymes as renin (chemosin), gas- tricsin, an insignificant quantity of salt, water, and glucose is absorbed. Stomach histological differentiation lasts up to the end of the second year of life. Abdominal salivary gland is the main gland of alimentary canal; its secretion grows up quickly after adding a lure and reaches an adult's level of secretion up to the age of 5. The main enzymes of pancreatic juice are the following: tripsin, chemo- trypsin, diastase, amylase, lipase, phospholipase, incretory insulin secretion. The newly-born's liver is relatively big, makes 4- 4.4% of body weight, is much vascularized, conjunctive tissue is not well-developed and parts are badly separated, is immature in functional aspect. The function of glycogen forming is well-ex- posed, while the function of disintoxication is poor. Liver takes part in the processes of alimentation, blood forming, blood circulation and metabolism.

During the first months of a child's life bile is produced in small quantity, contains a small quantity of bile acids which sometimes leads to steatorrhea among newly-borns; at the same time it contains a lot of water, mucin, and pigments; the newly-born's bile contains urine. It also contains more taurocholine acid than gluco- choline one which increases its bactericidal properties, stimulates abdominal salivary gland secretion and enforces the large intestine's peristalsis. Infant's bowels are relatively long in comparison with those of an adult, they are 6 times longer its body. The tunica mucosa is delicate, rich in fibres, blood vessels, and cellular elements. The glands are well-developed. The blind gut and appendix are movable; the descending section of the large intestine is longer than the ascending one. The rectum is relatively long, has slightly fixed mucous and submucous tunics. Child's bowels perform alimentary, movable, and absorption functions. Intestinal juice is less active in comparison with that of an adult, it has a weak acid or neutral reaction, and soon it possesses an alkaline reaction. It contains the following enzymes: enterocynase, alkaline phosphatase, amylase, maltase, invertase, and soon lipase. Hydrolysis products which are formed as a result of cavernous (distant) and membranous (periwall) alimentation are absorbed in the small intestine by all its sections, which is absent among adults. Intracellular

digestion with an easy transition of milk lactoglobulin into blood in unchanged condition has a great importance for children. Water is absorbed, fecal masses are formed, and mucus secretion takes place in the large intestine. The peculiar feature of children's bowels is relatively weak but long frill which provides favourable conditions for intussusception development.

Methodic of the digestive system investigation

Complaints and anamnesis

Thoroughly collected complaints and anamnestic data occupy a leading role in diagnostics of the digestive system organs. The most common complaints of the digestive organs damage are the following:

- Abdominal pains.
- Dyspeptic syndrome. Includes the following symptoms: belching (may be physiological in infants due to underdeveloped cardiac sphincter and pathological one in gastroesophageal reflux, esophagitis, hiatal hernia, cardia's insufficiency, chronic gastritis, gastroduodenitis, ulcer; acid belching is typical for hyperacidic states and foul one – for achylia);
 - Nausea develops in intraduodenal pressure increase and is typical for duodenal processes (duodenitis, gastroduodenitis, duodenal ulcers);
 - Heartburn is marked in gastroesophageal reflux, esophagitis and is caused by stomach's acid contents returning back to the esophagus;
 - Vomiting is more typical for children younger age and may be induced by either central mechanisms or gastroduodenal zone local irritation. Preceding nausea differs the vomiting in chronic gastritis, gastroduodenitis, ulcer, intestinal infections and food toxicoinfections from the same one caused by the vomiting center direct irritation. Vomiting in infants may be a sign of pylorospasm or pylorostenosis;
 - Rumination – a symptom usually developing in children with intellectual delay. Belched vomiting masses are swallowed by a child again;
 - Acidic or bitter (or metallic) taste in the mouth. The first one is marked in hyperacidic states and the second one – in gallbladder pathology accompanying with cholestasis;
 - Appetite changes (bad appetite up to anorexia, marked increasing of appetite – bulimia and selective appetite)
 - Intestinal dyspepsia signs such as meteorism (bloating), constipations, diarrhea.

Meteorism is resulted by damaged absorption of gases and fluid mainly in terminal ileum or proximal colon. That's why it is usually marked in enterocolitis and intestinal dysbiosis.

General inspection

General examination of a child with the digestive system pathology is started with inspection of an oral cavity (special attention should be paid first of all on presence of sources of chronic infection like carious teeth or chronic tonsillitis and secondly – on child's tongue: its color, presence of any layers, white or yellow ones, sizes, surface and moisture).

Inspection of the abdomen includes evaluation of:

- Participation of abdomen in breathing act (it is limited in appendicitis, cholecystitis; visually detected resistance and tension of the abdominal wall is marked in peritonitis)
- Visually defined increased peristalsis of the stomach (looking like a sand glass and typical for pylorostenosis) or intestines (marked in intestinal obstruction)
- Enlargement of the abdomen (is marked in obesity, meteorism, ascitis, pseudoascitis, chronic tuberculous peritonitis, liver's and spleen's significant enlargement, abdominal cavity tumors, anomalies of intestines' development).
- Falling back of the abdominal wall is detected in acute peritonitis, sharp exhaustion, dysentery and other diseases.
- Subcutaneous venous net development (marked venous net in newborns may testify to sepsis; in elder children it is a sign of portal hypertension (intrahepatic or extrahepatic ones).
- Edema of the anterior abdominal wall (umbilical sepsis in newborns and septic enterocolitis, in elder children – in ascitis and tuberculous peritonitis).

Palpation. Abdomen should be palpated slowly with tender movements of warm hand slightly touching the abdominal wall and gradually increasing the strength of pressure.

Deep palpation is carried out in the following order: sigmoid colon, caecum, ascending colon, transverse colon, stomach (greater curvature of stomach) and descending colon. The liver's lower margin may jet out of the right costal rib for 1 – 3 cm to age of 5 – 7 years. In elder children it shouldn't be palpated lower than the right costal arch.

It is quite difficult to palpate pancreas, therefore in everyday practice painfulness in points of pancreas' projection is evaluated. There are the following points: Desjardin's, Mayo-Robson's, Kacha's points and Shoffar's zone (it should be noted that painfulness in palpation in this region testifies to either pathology of pancreas' head or gastroduodenal pathology). Appearing of pain in palpation in Desjardin's point is a

sign of pancreas' head problems, in Mayo-Robson's and Kacha's points – about probable pathological process in pancreas' tail.

Percussion. Percussion of the abdominal cavity organs reveals tympanic resonance over its entire surface due to gas presence inside the intestines and dull sound which is defined over the liver, spleen, sigmoid colon and urinary bladder when it is full of urine.

Auscultation. It is needed for estimation of intestinal sounds – rumbling which reflects normal, increased, decreased or absent peristalsis. With the help of auscultative friction method stomach's lower margin may be estimated.

The Main Syndromes of Children's Digestive System Affections

1. The syndrome of "*acute stomach*". It appears because of affection or acute diseases of abdominal cavity organs and needs immediate medical aid. Symptoms: pain in the stomach which sometimes leads in the state of shock, the Shchotkin-Blumberg positive symptom, vomiting, defecation gas evacuation delay, diarrhea, melena, Hippocratic face, the syndrome of intoxication.

2. The syndrome of stomach and bowel *dyspepsia*. Stomach dyspepsia appears as a result of rude alimentary disorders, as well as a result of worsening of chronic inflammatory processes, mostly among older children.

3. The *malabsorption* syndrome. It is a clinical complex of symptoms connected with the final feeding product absorption disorder in the small intestine.

4. 4. The *jaundice* syndrome.

5. *Hepatocellular jaundice* appears as a result of hepatocyte cytolysis.

6. *Mechanic hepatocellular jaundice*. Appears when the bile outflow is disordered, bile-excreting routes obturation as a result of the inborn anomaly, calculous cholecystitis, regional glands increasing, and bile-excreting routes atresia.

Tests

1. The suction act is promoted by:

- 1.1. A relatively large mouth cavity.
- 1.2. Well-exposed cheeks adipose body.
- 1.3. A large tongue.
- 1.4. Cylinder-like bulges on gums.
- 1.5. Well-developed muscles of mouth and cheeks.

2. The newly-born's stomach capacity makes:

- 2.1. 30-35 ml.
- 2.2. 50-60 ml.
- 2.3. 100-150 ml.

- 2.4. 200-250 ml.
3. The main active enzyme in the newly-borns' stomach liquid is:
 - 3.1. Pepsin.
 - 3.2. Chymosin (labenzyme, rennet).
 - 3.3. Lipase.
 - 3.4. Amylase.
 - 3.5. Entrokinase.
4. The liver boundaries of a 1-year-old child are:
 - 4.1. Upper - 5th-6th rib, lower - 1—2 cm lower than the costal margin.
 - 4.2. Upper - 6th rib, lower - 3—4 cm lower than the costal margin.
 - 4.3. Upper - 4th rib, lower - 5 cm lower than the costal margin.
5. The infants' bowels length must be longer in comparison with the body length by:
 - 5.1. 2 times.
 - 5.2. 6 times.
 - 5.3. 4 times.
 - 5.4. 10 times.
 - 5.5. 3 times.
6. Which of the given below is not typical of the normal bowels microflora?
 - 6.1. Creates an immunologic barrier.
 - 6.2. Promotes final gastrointestinal digestion.
 - 6.3. Promotes vitamin and enzymes synthesis.
 - 6.4. Provokes bowels mucous tunics inflammation.
7. What do naturally fed infants' feces look like?
 - 7.1. Semi-liquid, of yellow colour.
 - 7.2. Perfect.
 - 7.3. With white masses.
 - 7.4. Of green colour, liquid.
 - 7.5. With blood and slime.
8. Which bowels microflora is the dominant one among children who are naturally fed?
 - 8.1. Bifidoflora.
 - 8.2. Colon bacillus.
 - 8.3. Staphylococcus.
 - 8.4. Enterococcus.
 - 8.5. Yeast-like fungus.
9. Pain in the left low part of the stomach usually appears during:
 - 9.1. Stomach diseases.
 - 9.2. Appendicitis.
 - 9.3. Gallbladder diseases.

- 9.4. Dysentery
 - 9.5. Hepatitis.
10. Which symptom is not characteristic of gallbladder and bile- duct affection?
- 10.1. Ortner's.
 - 10.2. Pasternatsky's.
 - 10.3. Ker's.
 - 10.4. Heorhievsky-Mussi.
 - 10.5. Murphy's.

Correct answers: **1.1; 2.1; 3.2; 4.1; 5.2; 6.4; 7.1; 8.1; 9.4; 10.2.**

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
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“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S URINARY SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S URINARY SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS

The Topic relevance. The qualitative changes in the work of the urinary system take place after the birth of a child. Even an embryo has functioning kidneys, and its urine is of great importance for keeping the amniotic fluid volume. The excretion of fetus's substances is provided by placenta. Kidneys get the leading role in the provision of organism homeostasis from the moment of birth. Their function lies in keeping the right volume of blood and inner environment liquid, in the provision of constant concentration of the osmotic active substances and separate ions, pH, the final exchange products excretion, foreign substances. The knowledge of the peculiarities of the children's urinary system structure and functioning is the basis for exact diagnosis and appropriate treatment.

The aim of the lesson: to study the peculiarities of the children's urinary system structure and functions, to find out the most important features of urine tracts affection, to learn how to investigate and estimate the state of the urinary system of children of different age.

Follow-up questions:

1. Anatomic and physiological peculiarities of children's kidneys, urinary tracts, urinary bladder.
2. Peculiarities of kidneys functional state.
3. Symptoms and syndromes resulted by transitory and residual loss of kidneys homeostatic functions.
4. Quantitative and qualitative indexes of urinary excretion in different age periods.
5. Disease semiotics of urinary organs: edema syndrome, nephrotic syndrome, nephritic syndrome, arterial hypertension syndrome, urinary syndrome.
6. The methods of the children's urinary system investigation.

Having covered the topic, the student should be able to:

1. Define and estimate complaints which are characteristic of the urinary system affection, collect family and individual anamnesis (history).
2. Be able to conduct the kidney palpation by Obraztsov— Strazhesko's and Botkin's method.
 3. Be able to detect evident and hidden edemas.
4. Be able to estimate the clinical urine analysis, urine analysis by Nechyporenko, Addis-Kakovsky, Ambourge; estimate the results of bacteriological urine investigation.

5. Know how to interpret indexes of biochemical blood investigation used in nephrology: creatinine, urine acid, general protein and its fractions, cholesterol and electrolytes.
6. Know how to interpret indexes of the main laboratory functional kidneys investigations: Zymnyski's test, Ruberg's test, loading tests (the test on concentration, the water loading test).
7. Know how to evaluate the roentgenogram: X-ray of the abdominal cavity organs, excretory urography, voiding (micturating) cystography, etc.

Anatomic and Physiological Peculiarities of the Children's Urinary System

Relatively large kidneys size and shorter back girdle's part determine the kidneys topographical location during the first years of life. The kidneys upper pole is located on the level of XI-XII thoracic (dorsal) vertebrae, while the lower pole is located on the level of the IV lumbar vertebra, in other words lower than the glomerular bone's crest. Kidneys are more movable among children of early age which is explained by the weak development of adipose body of the kidney. Kidneys have a lobular structure during the first years of life. Kidneys jutting out parts are relatively broader; urinary tracts are splinted at a sharp angle. Urinary tracts are wavy, a bit hypotonic and have a relatively large diameter. The infant's urinary bladder is located above the symphysis; later on it goes down to the small pelvis. The girls' urethra is shorter and broader than that of boys' in all age periods.

The children's urinary system anatomic peculiarities mentioned above are the reasons for possible microbial-inflammatory diseases development, and thus, they influence the interpretation of definite instrumental investigations and the methods of diagnostics investigation conducting.

Urine secretion with its pouring to alantoic and amniotic liquids is detected even throughout the prenatal period. Urine is hypotonic to blood plasma and contains little urine acid, urea, and chloride at this stage. After birth kidneys become the main organs responsible for providing the vitally necessary permanency of the organism inner environment. The kidneys concentration function is limited among the children of early age. Urine low density is connected with the glomerule low diameter, antidiuretic hormone low production, underdevelopment osmoregulators, functional immaturity of distal renal tubules' epithelium, etc.

The infants' general diuresis is 2-3 times higher than that of the children of older age. It makes 80—90 ml per kg of body weight during the first months of life and about 50 ml per kg of body weight among children of 8—10. Taking these peculiarities into account, it is recommended to prescribe about 200 ml of liquid per 1 kg of body weight to infants. At the same time, besides the increased diuresis, the child's organism is not

able to compensate the superfluous liquid injection quickly, which may lead in anxiety, retching, diarrhea, polyuria, and convulsions. The high tubular (canalicular) absorption (99.4—100%) determines the low tempo of chloride release which leads in sodium chloride deposition in tissues and filtration decrease. That is why the superfluous sodium chloride injection may be accompanied by significant diuresis dysfunction, even anuria, hypostases, the so-called salt fever.

The imperfection of water and sodium reabsorption mechanisms in distal straight renal tubules is enforced by functional unripeness of processes connected with hydrogen ions and ammonia synthesis in this particular district of tubule apparatus; as a result of it conditions for serious metabolic acidosis may appear. Urine approaches adults' indexes by its functional indexes during the final differentiation and ripening of kidneys morphological structures (5—7 years).

Methods of Children's Urinary System Organs Examination

Collecting *complaints* and *anamnestic data* of patients with the urinary system problems it is necessary to find out:

- Dysuric symptoms
- Quantity of discharged urine per day
- Presence of thirst and quantity of drunk water per day
- The time of symptoms manifestation
- What has preceded the disease (angina, scarlet fever, acute respiratory diseases, vaccinations, etc.)
- Headaches, lumbar pains, edemas, changes of urine color and other symptoms in the anamnesis

General inspection

- Paleness of skin.
- Edematic syndrome.
- Pain syndrome.
- Arterial hypertension.

Palpation. It is possible to palpate kidneys (usually right one) in children of an early age with malnutrition only.

Urine investigation

Clinical investigation of urine includes evaluation of its physical features, chemical contents and sediment compound. Normal urine is transparent. Changes of urine transparency may be caused by increased quantity of salts, cell elements, mucus or fat in it. If turbidity leaves after heating it was caused by high quantity of urates in urine. If it doesn't disappear in heating it is necessary to add some drops of acetic acid:

disappearing of turbidity in this case testifies to great quantity of phosphates, if the received solution is hissing in this, it tells about exciting quantity of carbonates.

Urinary System Affections Semiotics

Dysuric syndrome - complex of symptoms which testify the pathological character of urination act.

- *Incontinence* — urination without preliminary vesical tenesmus.
- *Enuresis* - urination without preliminary vesical tenesmus at night time.
- *Incontinence* - urination after imperative preliminary vesical tenesmus.
 - *Strangulation* - pain during urination.
- *Ischuria (delay in urination)* - absence of urine after vesical tenesmus while urine is present in urinary bladder.
 - *Polakiuria* - increase of urination frequency.
- *Oliguria* - lowering of the daily urine quantity to 20-30% .
 - *Anuria* - lowering of the daily urine quantity to 6-7% .
- *Polyuria* - increase of the daily urine quantity by 1.5 times compared to the normal range
 - *Nocturia* - prevailing of night time urination over that of the daytime.

Nephrotic syndrome - a complex of symptoms among which the following can be found: proteinuria is more than 3 gr. per day, hypoproteinemia, hypercholesterolemia, edemata. These are characteristic features of nephrosis and nephritis.

Nephritic syndrome - a complex of symptoms among which the following can be found: moderate oedemata, hematuria, hypertension. Is characteristic feature of nephritis.

Urine syndrome - any changes of quantitative and qualitative urine composition detected during the laboratory examination of urine. Is represented by *macrohematuria, microhematuria, leukocyturia, bacteriuria, proteinuria, cylinderuria, crystaluria, glucosuria, cetoneria, changes in urine pH, and other symptoms.*

Tests

1. The peculiarity of the kidneys tubules function of children is the following:
 - 1.1. Reabsorption is low, secretion is increased.
 - 1.2. Reabsorption is low, secretion is low.
 - 1.3. Reabsorption is low, secretion is low.
 - 1.4. Reabsorption is increased, secretion is increased.
2. Urination starts its formation when a child is:
 - 2.1. On the 2nd week of pre-natal development.

- 2.2. On the 5th week of pre-natal development.
 - 2.3. On the 10th week of pre-natal development.
 - 2.4. On the 16th week of pre-natal development.
 - 2.5. On the 20th week of pre-natal development.
3. Children's kidneys tubules have the following peculiarities:
- 3.1. Their quantity per kidneys surface's conditional unit is big, their size is small.
 - 3.2. Their quantity per kidneys surface's conditional unit is small, their size is small.
 - 3.3. Their quantity per kidneys surface's conditional unit is bigger, their size is small.
 - 3.4. Their quantity per kidneys surface's conditional unit is less, their size is big.
4. Kidneys tubules of the children of early age are:
- 4.1. Broad.
 - 4.2. Narrow.
 - 4.3. Long.
5. The index of the tubules filtration of infants is lowered due to:
- 5.1. Big tubules size.
 - 5.2. Small tubules size.
 - 5.3. Big filtration surface.
 - 5.4. Increased effective pressure.
6. Tubules filtration function is evaluated by:
- 6.1. Zymnyskyi's test.
 - 6.2. Nechyporenko's test.
 - 6.3. Reburg—Tareyev test.
 - 6.4. Folgard test.
7. The clearance indexes of newborns by endogenous creatinine make (ml per minute):
- 7.1. 5-10.
 - 7.2. 20-40.
 - 7.3. 70-90.
 - 7.4. 80-100.
8. The road clearance indexes by endogenous creatinine of children older than 1 year make (ml per minute):
- 8.1. 50-70.
 - 8.2. 70-90.
 - 8.3. 100-120.
9. The visceral sheet of tubules capsule of the children of early age is covered by:
- 9.1. Cubical epithelium.

- 9.2. Cylindrical epithelium.
- 9.3. Pavement epithelium.
- 10. Normal urine quantity depending on the liquid drank makes:
 - 10.1. 30-35%.
 - 10.2. 50-55%.
 - 10.3. 70-75%.
- 11. Normal leukocytes indexes by Nechyporenko make:
 - 11.1. 0-2000.
 - 11.2. 4-6000.
 - 11.3. 8-10000.
- 12. The nephritic syndrome is typical for:
 - 12.1. Pyelonephritis.
 - 12.2. Glomerulonephritis.
 - 12.3. Cystitis.
 - 12.4. Urolithiasis.
- 13. By what value does diuresis decrease dependent on daily age value in case of oliguria?
 - 13.1. $1/2$.
 - 13.2. $1/3$.
 - 13.3. $2/3$.
- 14. The main acute renal insufficiency symptom is:
 - 14.1. Oliguria which transforms into anuria.
 - 14.2. Headache.
 - 14.3. Convulsions.
 - 14.4. Hyperpotassemia.
 - 14.5. Hypocalcemia.
- 15. What urine thickness fluctuations are typical of children of the first year of life?
 - 15.1. 1002-1017.
 - 15.2. 1010-1017.
 - 15.3. 15.3.1012-1020.
 - 15.4. 15.4.1011-1025.

Correct answers: 1.3; 2.3; 3.3; 4.2; 5.2; 6.3; 7.2; 8.2; 9.1; 10.3; 11.1; 12.2; 13.3; 14.1; 15.1.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S ENDOCRINE SYSTEM. METHODS OF INVESTIGATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S ENDOCRINE SYSTEM. METHODS OF INVESTIGATION. AFFECTIONS SEMIOTICS

Topic relevance. Substances exchange and energy exchange, growth and development, genetic program realization, organism some systems interaction are performed due to the presence of neuroendocrine vital functions regulations. Moreover, endocrine regulation is as important as the nervous system. Endocrine system development of children has definite peculiarities; their violation requires timely diagnostics for serious diseases development prevention.

The aim of the lesson: to study the peculiarities of endocrine glands composition and functioning of children of different age, to master the methods of investigation of endocrine system, to know the most important indications of their dysfunction.

Follow-up question:

1. The human being's endocrine glands and the hormones they produce.
2. The regularities of endocrine system formation in the antenatal period.
 3. The mother's and fetus' hormone interaction.
 4. The newborns' endocrine glands functional peculiarities.
5. The regularities of endocrine glands structure and functions development in the post-natal period.
6. The most important clinical marks of endocrine glands affection.

Having covered the topic, student should be able to:

1. Point out complaints typical of endocrine system affections, collect individual and family anamnesis.
2. Conduct objective investigation of the endocrine system of children of different age and evaluate the obtained data.
3. Work out the plan of laboratory and instrumental investigation in case of suspected endocrine system affection.
4. Evaluate the results of laboratory-instrumental investigations.

Methods of Endocrine System Investigation

1. Questioning. It is necessary to find out the complaints typical of endocrine system affections.
2. Anthropometry and child's physical development evaluation.
3. Examination. It is necessary to pay attention on skin colour, elasticity, and humidity, skin appendages state, the state of development and the character of location

of hypodermic fatty tissue, exophthalmos presence, thyroid gland enlargement, the degree of secondary sexual features development.

4. Palpation of thyroid gland, mammary glands, testicles, abdominal cavity organs.
5. Percussion and auscultation (heart and lungs).
6. Prescriptions and laboratory and instrumental methods of investigation evaluation (by symptoms).

Regularities of Sexual Maturity Characters Appearance

For girls:

- 9- 10 years - pelvis cells growth, buttocks rounding, insignificant mammary glands nipples rise;
- 10- 11 years - mammary glands conoids rise (the so-called "bud" stage), single hairs appearance on mons veneris;
- 11- 12 years - external sexual organs enlargement, the change of epithelial cells;
- 12- 13 years - significant development of mammary glands tissue, nipples pigmentation, first menstruation;
- 13- 14 years - hairs growth on axillary area, irregular menstruations;
- 15-16 years - acne appearance on face and body, regular menstruations.

For boys:

- 10- 11 years - testicles and penis size enlargement;
- 11- 12 years — prostata gland and larynx growth, single hairs appearance on pubis;
- 12- 13 years - hairs grow on pubis by womanish type;
- 13- 14 years - significant growth of testicles and penis, nodular induration of peripapillary zone, beginning of voice mutation;
- 14- 15 years - hairs growth in axillary cavities, further voice mutation, hairs growth on face, scrotum pigmentation, first ejaculation;
- 15-17 years - spermatozoa ripening, adult male pattern of hair distribution, hairs growth on the whole body.

The Essence and Puberty Characters of Different Stages Indexes

For girls:

P - hair distribution on pubis (P₀- hair distribution is absent, P₁ - single hairs, P₂- hair in the pubis centre, hairs are long and straight, P₃- hair distribution on pubis peripheral zones, P₄-hair is on the whole pubis triangle, long, dense and curly);

Ax - hair distribution in axillae (Ax₀- hair is absent, Ax_t - single hairs, Ax₂ - rare hair in the centre of axillae, Ax₃ - hair distribution in axillae periphery, Ax₄ - thick curly hair on the whole axillae surface);

Ma - mammal gland development (Ma₀ - no development characters, Ma_t - nipples are a bit raised, Ma₂- the mammal gland is of conoid form, the so-called "bud" stage, widened and pigmented peripapillary circle, Ma₃ - the mammal gland acquires a round form, nipples rise over the peripapillary circle, Ma₄- the completed development of the mammal gland);

Me - menstruation presence (Me₀ - menstruations are absent, Me_t - first menstruations, Me₂- unstable menstruation cycle, Me₃ - regular menstruations over a year).

For boys:

P - hair distribution on pubis (P_Q - hair is absent, P_x - single straight hairs near the penis root, P₂- hair over the whole pubis zone, P₃ - thick curly hair in the form of a triangle on the pubis, P₄ - thick curly hair spread over the stomach in the direction of the navel and internal hips surface);

Ax - hair distribution in axillae;

F - hair growth on the face (F₀- hair is absent, F_t - single hairs of weak pigmentation in upper lip's corners, F₂- hair growth on chin and cheeks, F₃ - all the zones of hair distribution are mixed up);

L - thyroid cartilage growth (L₀-L₂);

V - voice timbre change (V₀- childish voice, V_j - voice mutation, V₂- male timbre).

Tests

1. Point out the average age of puberty start in girls:
 - 1.1. 9.5-10.5 years.
 - 1.2. 11.5-12.5 years.
 - 1.3. 13-14 years.
2. Formation genesis for the majority of endocrine glands starts within the following term of pregnancy:
 - 2.1. 2-4 weeks.
 - 2.2. 5-7 weeks.
 - 2.3. 8-9 weeks.
 - 2.4. 10-12 weeks.
3. Which of the given below hormones is not secreted in adeno- hypophysis?
 - 3.1. Somatotropin.
 - 3.2. Adrenocorticotropic hormone.

- 3.3. Thyroid stimulating hormone.
- 3.4. Vasopressin.
- 3.5. Prolactin.
4. Which of the secondary sexual characters are the first to appear for girls?
 - 4.1. Hair distribution in axillae.
 - 4.2. Pubis hair distribution.
 - 4.3. Mammal glands development.
 - 4.4. Menstruations appearance.
5. Which of the given below is not typical of hypophysis affection?
 - 5.1. Giantism.
 - 5.2. Growth delay.
 - 5.3. Cramps.
 - 5.4. Adiposity.
 - 5.5. Polyuria.
6. Point out the average age of puberty beginning for boys:
 - 6.1. 9.5-10.5 years.
 - 6.2. 11.5-12.5 years.
 - 6.3. 13-14 years.
7. Which of the given below clinical signs is not typical for congenital thyroid deficiency?
 - 7.1. Body weight at the moment of birth more than 4000 gr.
 - 7.2. Long period of jaundice.
 - 7.3. Meconium late release.
 - 7.4. Exophthalmos.
 - 7.5. Low voice timbre.
8. What hormones are not synthesised by adrenal cortex?
 - 8.1. Adrenaline.
 - 8.2. Cortisol.
 - 8.3. Aldosterone.
 - 8.4. Androgens.
- 8.4. Which of the symptoms is not typical of adrenal glands affection?
 - 8.5. Hypertension.
 - 8.6. Growth delay.
 - 8.7. Giantism.
 - 8.8. Adiposity.
 - 8.9. Generalised skin pigmentation.
9. What hormone is not synthesised by pancreas?
 - 9.1. Glucagon.
 - 9.2. Calcitonin.

- 9.3. Gastrin.
- 9.4. Insulin.
- 10. Which of the given below signs is not typical of the pancreatic island apparatus affection?
 - 10.1. Polydipsia.
 - 10.2. Polyuria.
 - 10.3. Skin dryness.
 - 10.4. Hypertension.
 - 10.5. Polyphagia.

Correct answers: 1.1; 2.2; 3.4; 4.3; 5.3; 6.3; 7.4; 8.1; 9.3; 10.2.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S HEMATOPOIETIC SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS
Course	3
Faculty	Medical №2

ANATOMIC AND PHYSIOLOGICAL PECULIARITIES OF THE CHILDREN'S HEMATOPOIETIC SYSTEM. METHODS OF EXAMINATION. AFFECTIONS SEMIOTICS

Topic relevance. Natural physiological age changes typical of children's hematoses are to be taken into account while evaluating the hemogram. Blood joints all inner organs and systems being one of major indexes of organism state.

Doctors of different specialties are to know how to evaluate the hemogram.

The aim of the lesson: to study hematoses peculiarities of children of different age, to be able to evaluate the hematopoietic system state of different periods of childhood, to point out hematopoietic organs affections symptoms.

Follow-up questions:

1. The stages of pre-natal hematoses.
2. Newborn's peripheral blood peculiarities.
3. Age peculiarities of erythrocytic chain changes.
4. Age peculiarities of the leukocytic chain.
5. Age peculiarities of the thrombocyte chain.
6. Age changes in myelogram.
7. Main indexes of coagulogram.

Having covered the topic, the student should be able to:

1. Evaluate the hemogram of a child of any age.
2. Detect the symptoms of hematopoietic system affections.
3. Detect pathological changes in a child's myelogram.
4. Detect pathological changes in a child's coagulogram.

The Stages of Pre-Natal Hematoses

- 3-6 weeks - hematoses takes place in the yolk (vitelline) sac (a primitive erythroblasts formation);

- 6 weeks-5 months - liver hematoses (erythroid, neutrophils and megakaryocytes cells formation) with the following stop at the end of the pre-natal period;

- 12 weeks-5 months - liver-splenic hematopoiesis (lymphocytes and monocytes are formed in the spleen);

- beginning from the 4th month marrow hematoses begins, it becomes the primary one up to the end of pre-natal period and for the life time.

Methods of Hematopoietic System Examination

Complaints: bleeding, hemorrhages, lymphatic glands enlargement, skin and mucous tunics paleness.

Heredity investigation: bleeding, jaundice, anemias.

Disease anamnesis: the date of signs appearance, the conditions of their appearance, pathological symptoms dynamics, the results of previous laboratory investigations.

Life anamnesis: prematurity, pregnant anemia and toxicosis, multiple pregnancies, bringing up, immune conflicts presence, prenatal infections.

General inspection in blood system diseases is of great diagnostic value. The following signs should be evaluated in general inspection of a patient:

- Color of skin and mucous tunics (paleness is typical for anemias: primary or symptomatic ones in malignant hemopathies; icteritiousness of skin and sclera may be a sign of hemolytic anemia, erythrocytopathy or hemoglobinopathy);
- Hemorrhages (from small dotted petechias to ecchymoses and hematomas). Symmetric macular or macular-and-papular rash with main localization on extensor surface of the extremities, near the joints and on buttocks is typical for hemorrhagic vasculitis. Hematomas, hemarthroses or traces such as joints deformation and muscular atrophy are detected in hemophilia;
- Lymph nodes enlargement;
- Enlargement of liver and spleen.

Palpation. Palpation makes it possible to estimate the state of lymph nodes, enlargement of liver and spleen, pain in bones and joints (leukosis), defects of flat bones of the skull (reticulosis), etc.

Laboratory investigation results evaluation: hemogram, myelogram, lymphadenogram, and coagulogram results evaluation. In case of their absence or indication presence it is necessary to prescribe a plan of child's investigation with the aim of detecting hematological pathology presence or absence.

Affections Semiotics

Anemia syndrome: anemia is a state characterized by erythrocytes quantity and hemoglobin content decrease in a blood volume unit. The following types of anemia are distinguished: posthemorrhagic anemias, anemias caused by hematois violation (iron deficient, protein deficient, and B₁₂ folic deficient anemias), hemolytic anemias. Iron deficient anemia is the most typical of children of the first years of life.

Hemolytic syndrome is a group of diseases; enforced erythrolysis is a typical feature. On the one hand, it leads in anemia and increased erythrolysis products formation, and to enforced erythropoiesis as a compensatory response to the anemia, on the other hand. Typical examples are the newborns hemolytic disease,

Minkovsky-Shoffar's hereditary hemolytic anemia, and others accompanied by this syndrome.

Hemorrhagic syndrome is a clinical manifestation of organism susceptibility to multiple hemorrhages and extravasations as a result of insignificant traumas, and spontaneous manifestations. The group of diseases accompanied with this syndrome, is known under the term "hemorrhagic diatheses". They are divided into coagulopathy (hemophilia etc.), thrombocytopathy (Verlgolf's disease etc.), and angiopathy (Shenlane-Genokh's disease etc.).

Proliferative syndrome is detected as a result of acute and chronic leukosis. Pathological proliferation and development delay of little differentiated young cells composing the mass of tumor cells take place in case of acute leukosis. Enforced proliferation of unripe stages and their differentiation preservation up to ripe cellular elements takes place in case of chronic leukosis. The liver, spleen, and glands enlargement as a result of tumor proliferation is noticed, too.

Tests

1. Which type of hemorrhage is characterized by the presence of petechial hemorrhages, ecchymosis on skin and mucous tissues, spontaneous hemorrhage, rare hematomas and not affected locomotor function?
 - 1.1. Hematoma type.
 - 1.2. Vasculitis-purple type.
 - 1.3. Angiomatous type.
 - 1.4. Microcirculation type.
 - 1.5. Microcirculation-hematoma type.
2. What content of blast cells in the marrow is normal?
 - 2.1. Up to 10%.
 - 2.2. Up to 15%.
 - 2.3. Up to 5%.
 - 2.4. Up to 20%.
 - 2.5. Up to 25%.
3. Normal indexes of the minimal osmotic erythrocytes stability are the following:
 - 3.1. 0.42-0.38% NaCl.
 - 3.2. 0.48-0.40% NaCl.
 - 3.3. 0.48-0.52% NaCl.
 - 3.4. 0.52-0.60% NaCl.
4. One of laboratory tests of primary hemostasis is a:
 - 4.1. Myelogram.
 - 4.2. Coagulogram.
 - 4.3. Capillary wall resistance test.

- 4.4. Antithrombocytic antibody level.
5. The normal rate of newborn's Colour Index makes:
- 5.1. 0.8-1.0.
 - 5.2. 0.9-1.1.
 - 5.3. 0.85-0.9.
 - 5.4. 0.9-1.0.
6. The lymphocytes quantity in the myelogram of children of the first three years of life makes:
- 6.1. 10-18%.
 - 6.2. 7-14%.
 - 6.3. 2-8%.
 - 6.4. 8-12%.
7. What is called petechial element?
- 7.1. Hemorrhages of more than 5 mm size and irregular form.
 - 7.2. Hemorrhages of 2-5 mm size, of regular round form.
 - 7.3. Drop-like hemorrhages of 1-2 mm size.
 - 7.4. Hemorrhages in joints.
8. Verlhofs's disease pathological genesis is based on:
- 8.1. The violation of blood coagulation system.
 - 8.2. The violation of platelets formation and their composition.
 - 8.3. The vessel wall affection.
 - 8.4. Disseminated intravascular clotting (DIC).
9. What erythrocytes quantity is normal for the children of the first two days of life?
- 9.1. $4.5-5.0 \cdot 10^{12}/l$.
 - 9.2. $5.5-7.5 \cdot 10^{12}/l$
 - 9.3. $3.5-4.5 \cdot 10^{12}/l$
10. The bottom hemoglobin level in the blood of children of elder than 5 years makes:
- 10.1. 120 gr./l
 - 10.2. 110 gr./l
 - 10.3. 116 gr./l.
 - 10.4. 10.4/120 gr./l

Correct answers: **1.4; 2.5; 3.2; 4.3; 5.2; 6.1; 7.3; 8.2; 9.2; 10.4.**

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
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“ ____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	IMMUNE SYSTEM IN CHILDREN
Course	3
Faculty	Medical №2

Kyiv-2019

IMMUNE SYSTEM IN CHILDREN

Topic relevance. The children's immune system is at the stage of formation and development, which presupposes the originality of its reaction to antigenic stimulation. The knowledge of mechanisms of normal and pathologic immune reaction in general, peculiarities of children's immunity in age (ontogenetic) respect will facilitate adequate understanding of mechanisms of different diseases formation, will contribute to adequate differential diagnostics of normal, prenosological (diatheses), and pathological states of children.

The state of children's lymphatic apparatus reflects the processes of normal development, adaptation, immune system reactivity. Lymphatic apparatus state investigation is a necessary part of a patient's complex general-clinic examination. The understanding of morphological and functional peculiarities of glands, children's lymphoid apparatus significantly decreases the possibility of diagnostics mistakes.

The aim of the lesson: to study the patterns of immunity establishment, lymphatic apparatus development. To learn how to evaluate the immune system state, taking into account life and disease anamneses data, indexes of objective methods of investigation - clinic and laboratory immunological and to know typical changes of lymphatic apparatus accompanying pathological processes.

Follow-up questions:

1. Central and peripheral organs of the immune system.
2. Stages and patterns of immune system formation.
3. Factors of non-specific resistance.
4. Specific protection factors.
5. Age changes of main humoral and cellular specific and nonspecific immunity.
6. The main notions of clinical immunology.
7. Diseases groups typical of separate chains of immune defects.
8. The main laboratory immune diagnostics tests and prescriptions for their conducting.
9. Age standards for the main indexes of immunogram.
10. Methods of lymphatic apparatus investigation.
11. Typical changes in lymphatic apparatus accompanying pathological process.

Having covered the topic, the student should be able to:

1. Interpret the immunograms of children of different age.
2. Evaluate the reasons for conducting a child's immunological investigation and to work out the plan of such investigation.
3. Evaluate the complaints typical of lymphatic apparatus affections, to collect family and individual anamneses.

4. Conduct the objective examination of lymphatic apparatus of children of different age and to interpret the obtained data.
5. Prescribe a plan of laboratory-instrumental investigation of a child with lymphadenopathy, polyadenitis.
6. Interpret the data of laboratory-instrumental methods of lymphatic apparatus investigation.

Immunity is ability of an organism to protect itself from alive substances with a signs of genetic foreignness. Thereby immunity is developing of an organism's reaction directed on protection from infectious agents and other genetically alien substances penetrating through the organism from without or formed inside. Immune system is an independent system which is spread all over the whole organism; its cells are constantly circulating through the organism being a part of the lymphatic and blood systems; it is able to form specific molecules of antibodies (immunoglobulins) dependently on peculiarities of an antigen which has penetrated inside, connection between them is called antigenicity.

The immune system organs are divided into central (primary) and peripheral (secondary) ones. *Central organs* are:

- *Thymus* – is a source of T-lymphocytes. This gland is set on the 6-th week of gestation, lymphocytes appear on the 2 – 3 months of intrauterine development. After the birth thymus is relatively mature organ consisting of two parts surrounded by the capsule.

- *Fabricius' bursa* (immunity organ in birds). It's analog in human is the bone marrow (according to the point of view of the prevailing majority of scientist) or lymphoid apparatus of the intestines (according to convictions of others). In the bone marrow hemopoiesis cells appear on 12 – 14-th weeks of an intrauterine period. On 20-th week the bone marrow is a source of myelopoietic and lymphopoietic stem cells. Up to the end of pregnancy they are formed in the bone marrow only.

Immune system peripheral organs. After maturation and getting an immune competence in the central organs lymphocytes are transferring into the circulating stream (blood, lymph), and then – into the peripheral lymphoid organs. The main of them include:

- *Lymph nodes.* Their formation starts on 3 – 4-th months of an intrauterine development and ends on the first months of postnatal life. Structure of lymph nodes is the same as in thymus.

- *Spleen.* It starts its formation on the 5-th week of intrauterine period and ends some years after the birth. The structure reminds the same in thymus and lymph nodes. The main functions are: Immunologic (T and B lymphocytes and lymphoblasts formation); antibodies synthesis; hemostasis support.

- *Lymphatic tissue of stomach and intestines*. It is formed between 9 and 20 weeks of intrauterine development. It is an organized lymphoid tissue localized across the surface of stomach and intestines, appendix. Mesenteric lymph nodes belong to this group as well. Main functions are: antibodies synthesis, lymphocytes differentiation, mucous tunics' immunity formation; formation of the tolerance to a food staffs.

- *Lymphoid (Waldeyer's throat) ring*. It starts its development on 22 week of gestation and ends in the pubertal period only. Consists of reticular tissue mainly. Lymphoid tissue is represented by follicles. Tonsils contain T-, B-lymphocytes and plasmocytes.

- *MALT (mucus associated lymphatic tissue) and BALT (bronchus associated lymphatic tissue)* – lymphatic tissue in the gastrointestinal tract and bronchi.

1. *Palpation*. During lymphatic glands palpation their size (0.3— 0.5 cm is a norm), quantity (the glands, are considered to be solitary if there are not more than three of them in each group; if more, the glands are considered to be multiple), composition (normal glands are soft and elastic), mobility (normal glands are movable and not connected with the tissues surrounding them), pain during palpation (normally, there is no pain during palpation) are estimated.

Not more than 3 groups of glands are palpated among healthy children. Chin, supraclavicular, subclavian, thoracic, pronator, and popliteal glands are not palpated if a child is healthy.

4. *Laboratory and instrumental methods of investigation* - microscopy of glands, punctuated ultrasonic scanning, roentgenolym- phography, X-ray examination, computer tomography, thermography etc.

Cardiothymicothoracic Index

Cardiothymicothoracic index is estimated by the chest X-ray examination card analysis in direct projection by means of cardio- thymic (vascular fascicle) reflection width division in the part of trachea bifurcation (the third rib) by the chest transverse size at the level of diaphragm cupola. This index is used for thymomega- lia diagnostics.

Immune deficiency is a transitory violation of quantitative and functional immune system parameters, which may result in clinical symptoms of organism resistance decrease.

The state of immunodeficiency is a strict deficiency of one or more parameters (mechanisms) of immune response, which results in clear symptoms included into the group of self-dependent diseases (classic nosologic forms).

Immune system dysfunctions are any changes in the row of immune response indexes, which may be the evidence of immune compromise or immunodeficiency state.

Pathology Characteristics of the Defects of a certain Immune Chains

The T-cellular chain insufficiency:

- Recurrent virus, fungoid infections, protozoa invasion, persisting helminthiasis.
 - Serious complications during vital vaccination.
 - Total alopecia.
 - The high frequency of tumorous diseases in the family.

The B-cellular chain insufficiency:

- Recurrent and serious bacterial infections (different types of otitis, sinusitis, pneumonia, bronchitis, conjunctivitis, septicemia, meningitis); relatively rare appearance of fungoid and virus infections.

The phagocytosis compromise:

- Recurrent and serious skin and mucous tunics infections, including fungoid ones.
- Sinusitis, pneumonia, septicemia.
 - Repeated septic arthritis and osteomyelitis.

The complement system insufficiency:

- Autoimmune diseases.
- Recurrent pyogenous infections.

Recurrent meningococcal and gonococcal (gonorrhoeal) infections.

Main groups of the immune system diseases are:

- Immunodeficiency (primary and secondary, or acquired, one);
- Immune system infections in which the causative agent is inside the lymphocytes – infectious mononucleosis and acquired immunodeficiency syndrome (AIDS);
 - Immune system malignant diseases (lymphosarcoma, lymphogranulomatosis and lymphoma);
 - Diseases resulted by the immune system inadequate reacting – autoimmune pathology (glomerulonephritis, celiac disease, vitiligo, psoriasis, rheumatoid arthritis, etc.) and allergic diseases.

Primary immunodeficiency

Defects of the immune system formation lie at the basis of primary immunodeficiency development. There are 36 primary immunodeficient states divided into 5 main groups. They are:

- Humoral immunity deficiency
- Cell immunity deficiency
- Combined B- and T-immunodeficiency
- Phagocytes system deficiency
- Complement system deficiency

Humoral immunity deficiency is the most wide spread among primary immunodeficiencies. Brouton's disease is characterized with B-cells absence and low level of all immunoglobulins. Its main clinical symptoms are: diseases of ENT-organs, skin, central nervous system and bones, purulent infectious diseases of lungs. Development of allergic reactions and tumors is possible as well.

Secondary (acquired) immunodeficiency

Immunity damages due to different diseases and pathologic states are the basis of secondary immunodeficiency development.

Classification:

1. According to temps of the development: acute and chronic (on the background of acute and chronic diseases)
2. According to the immune system disorders (the same as in primary immunodeficiency)
3. According to occurrence: local and system ones
4. According to severity degree: compensated (mild degree), subcompensated (moderate degree) and decompensated (severe degree).

Main etiological factors:

- Bacterial and viral infections
- Protozoal and helminthic invasions
- Malignant tumors
- Inadequate (qualitatively and quantitatively) feeding
- Hypotrophy and paratrophy
- Congenital disorders of metabolism
- Physic and chemical factors
- Stressful factors
- "Natural" immunodeficiency (in early childhood, pregnancy and in aged people)

Main clinical signs :

- Frequently exacerbating chronic bacterial and viral diseases

- Physical development delay (hypotrophy, hypostature, nanism)
- Chronic diarrheas
- Low grade fever
- Hepatosplenomegalia
- Enlarged, immature or absent thymus and/or lymph nodes
- Stigmas
- Congenital heart defects
- Increased fatigability
- Allergic reactions
- Chemotherapy
- Significant physical loads
- Psychical stresses

Tests

1. The central organ of the immune system is:
 - 1.1. Spleen.
 - 1.2. Glands.
 - 1.3. Thymus.
 - 1.4. Peripheral blood lymphocytes.
2. The thymus reaches its maximum size at the age of:
 - 2.1. 1 year.
 - 2.2. 3 years.
 - 2.3. 5 years.
 - 2.4. 6-12 years.
 - 2.5. 16 years.
3. Peripheral blood cells capable of blast transformation are:
 - 3.1. Red corpuscles.
 - 3.2. Lymphocytes.
 - 3.3. Monocytes.
 - 3.4. Neutrophils.
 - 3.5. Eosinophilic (acidophilic) cells.
 - 3.6. Basophylic cells.
4. At what child's age does the secretory IgA synthesis reach the level similar to that of adults?
 - 4.1. 1 year.
 - 4.2. 5 years.
 - 4.3. 10 years.
 - 4.4. 15 years.

5. The following features are traced at the II critical stage of immune system development:
 - 5.1. Evident hyperimmunoglobulinemia.
 - 5.2. Evident hypimmunoglobulinemia.
 - 5.3. Immune memory formation.
 - 5.4. Maximum IgA secretory production.
6. The state of immune deficiency is:
 - 6.1. An insignificant transitory lowering of some immune system parameters.
 - 6.2. The newborns' physiological state.
 - 6.3. One of lymphatic diathesis manifestations.
 - 6.4. An acute deficiency of one or more immune response parameters (mechanisms).
7. The following is typical of the B-cellular immune chain lack:
 - 7.1. Recurrent mucous tunics candidiasis.
 - 7.2. Herpes labialis recurrent character.
 - 7.3. Recurrent ARVI.
 - 7.4. Recurrent purulent otitis.
8. Immunological tests of the I level include estimation of the following parameter:
 - 8.1. T-lymphocytes subpopulation.
 - 8.2. Immune regulatory index.
 - 8.3. Cytokine quantity.
 - 8.4. IgM serum level.
9. Immunological tests of the II level include estimation of the following parameter:
 - 9.1. Serum immunoglobulin subpopulation.
 - 9.2. Neutrophil phagocytic activity.
 - 9.3. Complement titre.
 - 9.4. CD 20 lymphocytes quantity.
10. IgM serum level is minimal among children in the following period:
 - 10.1. Newborns.
 - 10.2. Infants.
 - 10.3. Pre-school age.
 - 10.4. Primary school age.

Correct answers: 1.3; 2.4; 3.2; 4.3; 5.2; 6.4; 7.4; 8.4; 9.1; 10.1.

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Ministry of Health of Ukraine
National O.O. Bogomolets Medical University

“APPROVED”

At the staff meeting of the Department of pediatrics №4

Chief of the Department of Pediatrics №4
Academician, Professor, MD, PhD Maidannyk V.G.
_____ (Signature)

“ _____ ” _____ 2019 y.

Methodological recommendations for students

Subject	Pediatrics
Module 1	Pediatrics
Topic	FEEDING OF CHILDREN
Course	3
Faculty	Medical №2

FEEDING OF CHILDREN

Topic relevance. Long-term observations and investigations have proved that breast feeding during the first year of life is the basis for complete physical and mental development of a child, resistance to infectious and somatic diseases forming. At the same time, the obtained data have proved that attempts to feed infants and newborns with milk got from other biological species should become an ecological catastrophe. That is why the study of advantages and principles of breast feeding and measures directed on its support are necessary to increase the state of children's health. On the other hand, one should know the principles of adequate artificial and mixed feeding organization in case if breast feeding is impossible or contraindicated. Correctly organized feeding of children of any age, especially infants and children of first 5 years of life, is a huge basis for their harmonious physical and psychical development and health formation.

The aim of the lesson: to study the main rules of children's rational feeding, its great value for children, to analyze up-to-date views on this problem, to master the principles of the given way of feeding.

Follow-up questions:

1. Morphological and functional peculiarities of the digestive system of children in age aspect.
2. 10 principles of successful breast feeding by World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF).
3. Qualitative and quantitative colostrum, transitory and mature breast milk composition.
4. Peculiarities of breast milk which determine its extreme biological value in comparison with other species and their influence on child's development.
5. The estimation of the daily child's ration volume for the first year of life using different methods.
 6. Infant's need in main food nutrients and calories.
7. Terms and rules of food supplements and weaning introduction.
8. Approximate scheme of the breast fed child's feeding ratio on the first year of life.
9. Peculiarities of artificial feeding organization.
10. Peculiarities of mixed feeding organization.
 11. Peculiarities of prematurely born children feeding.
 12. Feeding of children elder than 1 year.

Having covered the topic, the student should be able to:

1. Make up the daily child's ration for the first year of life in case of breast, artificial and mixed types of feeding.
2. Evaluate the anamnesis data that show the quality of child's feeding, find out mistakes in child's ration and correct them according to the existing rules.
 3. Compose the alimentation ratio of a feeding mother.
 4. Compose the feeding ratio of children elder than 1 year.

Materials that might be helpful:

- Modern ways of breast feeding.
- First year of life children daily need in main nutrients during the breast feeding.
- Estimation formulas of daily breast milk volume for children.
- Recommended terms of adding and approximate quantity of correctional makeweight and feeding up of children of the first year of life.
 - The algorithm of the child's daily ration estimation.

Breast feeding

The feeding is considered to be the breast one when the child receives only mother's milk during the first year of life or when the breast milk constituent part makes not less than 4/5 of a daily food volume. The breast feeding is provided by the mother's mammary glands in their normal functioning. Mammary glands start their development in elder school age and are finally formed in time of pregnancy.

Lactation disorders semiotics

Lactational crisis

Approximately in 2/3 of all nursing mothers temporary lack of milk is marked on the 2-nd month of life. This physiological sign is called lactational crisis. It is caused by physiological postnatal hormonal changes in mother's organism in this period or mother's exhaustion. In some cases this crisis may occur several times during the whole breast feeding period.

The following measures should be undertaken in order to restore the normal quantity of milk:

- To increase the quantity of feedings
- To apply the child to both breasts in during one feeding
- To feed the child at night in order to stimulate secretion of prolactin
- Avoid giving the child the baby's dummy and drinking through the soother
- To protect mother's physical and psychological rest, provide her with massage, and improve her alimentation.

Hungry crisis is a short termed decrease of milk quantity in the mother's breast on 3, 7 and 12 months of lactation. This is caused by the increased "requests" of the child connected with the most intensive growth during these months. Hungry crisis is a physiological manifestation as well.

Hypogalactia is reduction of the mammary glands secretory function. In this a daily quantity of milk doesn't cover the needs of a child.

To calculate a necessary milk quantity for child's one time or daily feeding the following formulas are widely used:

N.F. Filatov's formula in G.LZaitseva's modification is used for children of the first 10 days of life:

Daily milk quantity (ml) = 2% child's body weight • n , where n is the day of life.

Finkilstein's formula in O.F. Tur's modification — for children of the first 10 days of life:

$n \cdot 70$ (if the child's body weight is less than 3200 gr. at the moment of birth).

$n \cdot 80$ (if the child's body weight is more than 3200 gr. at the moment of birth).

The method of Geibner-Cherny is used for children at the age starting from 2 weeks up to 9 months. The daily milk quantity makes: 2-6 weeks - 1/5 of body weight; 6 weeks - 4 months - 1/6 of body weight; 4-6 months - 1/7 of body weight; 6-9 months - 1/8 of body weight.

Daily quantity of milk during the first year of life must not be more than 1000-1100 ml.

The calories (energetic) method: a child must get for 1 kg of body weight:

1-5 months - 115 calories per day; 6-12 months - 110 calories per day;

It is easy to calculate a child's daily need in milk if to take into account the known fact: 1 liter of milk contains 700 calories.

The rules of weaning introduction

Weaning is a gradual replacing of the breast milk by cooked food. To the moment of weaning introduction enzymatic system of the intestines is mature enough to digest and assimilate some additive food except of milk.

Necessity of weaning introduction is caused by:

- Gradual reduce of the breast milk in mother's breast
- Insufficient quantity of proteins, carbohydrates and fats in the mother's breast from 6 months of child's life
- Increasing needs of the child's organism in minerals, which can't be covered with the breast milk
- Absence of cellulose, extremely needed for normal functioning of the digestive system, in the breast milk

- Formation of mastication skills during weaning, which contributes to speech apparatus harmonious development
- Habituation of the child to another foodstuff except of the breast milk

Artificial feeding

Artificial (bottle feeding, formula feeding) is a type of infant feeding in which he doesn't receive the breast milk at all or its quantity makes 1/5 and less of the whole daily volume. According to the latest data about 50% of infants in our country are transferred into an artificial feeding at the age of 3 months, more than 70% - at the age of 6 months. The only reason of such a great quantity of artificially fed children is not known.

Adapted milk formulas

They are prepared of a cow's milk mainly. In some countries with this aim mare's, goat's or camel's milk are also used. The most important advantage of adapted formulas is that they approximate to the breast milk by the contents of proteins, fats, carbohydrates, vitamins and minerals. They are adapted to the peculiarities of infants' digestion and metabolism besides.

Adapted sweet milk formulas are the following: "Detolact" (Ukraine), "Nutrilon" and "Friso" (Holland), "Humana" (Germany), "Bona" and "Tutteli" (Finland), "Nan" and "Alfare" (Switzerland), "SMA" and "Similac" (USA), "Premium" (England), "Hipp" (Austria), etc.

Unadapted milk formulas

Unadapted milk formulas are products of infant feeding during first year of life prepared of animals' fresh or dry milk without its special procession. They may be sweet and acid-milk.

Unadapted sweet milk formula is a milk of animals. In our country it is usually a cow's milk. As far as animals milk significantly differs from the breast one by its composition it should be first diluted with cereal broth before use. Prepared by boiling 5% broth (1 tea spoon of rice or buckwheat cereal on 100 ml of water) passes through a sieve and the milk is diluted with received fluid.

All unadapted formulas are divided into B-formulas and C-formulas according to the degree of their dilution. During 2 first weeks of life a child receives B-formula, in which milk-broth ratio makes 1:1. According to composition these formulas are called B-rice, B-buckwheat, etc. From 2 weeks to 3 months C-formula (C-rice, C-buckwheat, etc.) are used. In these formulas milk-broth ratio makes 2:1.

It is necessary to remember that intake of undiluted milk during first 3 months causes hyperosmolarity and hypernatremia. These disorders may easily lead in convulsions, central nervous system damage and lethargy. The danger significantly

grows with great external loss of the fluid (high temperature of the environment, hyperthermia, gastrointestinal diseases).

After 3 months of age undiluted milk may be used.

Main rules of artificial feeding

1. Prepared formula is given to a child from the bottle with a pacifier. It is necessary to hold the bottle atilt in order to avoid air getting to the oral cavity of a child (swallowing of great quantity of air leads in often regurgitations of eaten food and air).

2. For gradual coming of the food pacifier holes should be of such sizes, in which formula flows out with drops but not with a stream.

3. Formula should be sterile and warmed up to 37 – 38°C.

4. In case of necessity prepared formula may be stored no more than 2 hours in room temperature and 24 hours in the fridge.

5. Daily volume of food in artificial feeding corresponds to the age volume in breast feeding.

6. If to adhere to regularity daily quantity of feedings before weaning introduction is one less than in breast feeding and makes 6 from the first month of life. However, hypotrophic, undernourished, premature and weakened kids may be fed 7 – 8 times per day. Free regimen of feeding is the most reasonable. After weaning introduction the feeding regimen is the same in all kinds of feeding and makes 5 times per day.

7. The rules of food supplements given is identical the same in breast feeding.

8. Weaning are introduced at the same terms as in breast feeding.

9. Artificially fed infant must receive more proteins than breast fed ones. Quantitative needs in proteins depend on artificial formulas type as far adapted proteins absorption intensity is higher than unadapted ones besides.

10. Needs in fats and carbohydrates is equal in all types of feeding.

11. Energetic needs in calories don't anyhow depend on the type of feeding.

12. In case of child transferring into artificial feeding it is necessary to give an artificial formula first and then finish with the breast milk. Volume of formula is gradually increasing to complete replacement of milk by formula.

Mixed feeding

Mixed feeding is a feeding in which a child receives both breast milk and formula during first half year of life.

Possible ratios between noticed types of food are: 2:1, 1:1 and 1:2.

Receiving of an artificial mixture by a child in mixed feeding is called supplementation.

Feeding of children elder than 1 year

Feeding of children at early children's period

Feeding of children from 1 to 3 years of life is transitional period from feeding to adults' alimentation. Comparing with the first year of life early aged children have more developed processes of chewing, swallowing; all groups of salivary glands adjoin the digestion; all esophagus', stomach's and intestines' layers are strengthened; stomach's volume is increased to 300 – 350 ml. Food evacuation from the stomach finishes 4 hours after its intake, in the intestines it is held during 24 – 48 hours.

Tests

1. When does mature breast milk starts its secretion?
 - 1.1. Just after a child's birth.
 - 1.2. Within the first week.
 - 1.3. Within 1-2 weeks.
 - 1.4. Within 2-3 weeks.
 - 1.5. Within 3-4 weeks.
2. When is it necessary to give breast to a healthy newborn?
 - 2.1. Within 30-40 min after birth.
 - 2.2. In 60 min after birth.
 - 2.3. In 2 hours after birth.
 - 2.4. In 6 hours after birth.
 - 2.5. In 12 hours after birth.
3. Which factor of breast milk assists the Bifidobacterium flora development in child's bowels?
 - 3.1. Lysozyme.
 - 3.2. Lactoferrin.
 - 3.3. β -Lactose.
 - 3.4. S IgA.
 - 3.5. Polyunsaturated fatty acids.
4. What differs breast and cow's milk in fat aspect?
 - 4.1. There are more fats in breast milk.
 - 4.2. There are less fats in breast milk.
 - 4.3. Polyunsaturated fatty acids are absent in breast milk.
 - 4.4. There are more polysaturated fatty acids in breast milk.
 - 4.5. There are more polyunsaturated fatty acids in breast milk.
5. What differs the protein composition of cow's and breast milk?
 - 5.1. There are more proteins in breast milk.
 - 5.2. There are more globulins in breast milk.
 - 5.3. Protein quantity is the same in the cow's and breast milk.

- 5.4. There are more albumins in breast milk.
 - 5.5. There is more casein in breast milk.
6. Which secret contains the greatest quantity of S Ig A in a unit of measurement?
- 6.1. Mature breast milk.
 - 6.2. Transitory breast milk.
 - 6.3. Colostrum.
 - 6.4. Mouth cavity saliva.
 - 6.5. Respiratory tracts slime.
7. Which minerals are represented in greater quantity in breast milk in comparison with that of cow's?
- 7.1. Calcium.
 - 7.2. Phosphorus.
 - 7.3. Iron.
 - 7.4. Fluorine.
 - 7.5. Natrium.
8. Which of the given below immunoglobulins are represented in breast milk in greater quantity?
- 8.1. IgA.
 - 8.2. S IgA.
 - 8.3. IgG.
 - 8.4. IgM.
 - 8.5. IgE
- IgE.**
9. When is it necessary to add juice to the child's ration?
- 9.1. At the age of 1 week.
 - 9.2. At the age of 1-2 months.
 - 9.3. At the age of 2-3 months.
 - 9.4. At the age of 4-5 months.
 - 9.5. At the age of 7-8 months.
10. Which makeweight must be the first in the healthy child's ration?
- 10.1. Cheese.
 - 10.2. Kefir.
 - 10.3. Milk porridge.
 - 10.4. Vegetable puree.
 - 10.5. Clear soup.
11. In which daily milk quantity the feeding is already considered to be artificial?
- 11.1. Less than 25 %
 - 11.2. 25 – 50%

- 11.3. 50 – 75%
- 11.4. More than 75%
- 12. Which clinical sign doesn't testify to insufficient feeding?
 - 12.1. Anxiety
 - 12.2. Flattening of the body weight curve
 - 12.3. Body temperature increase
 - 12.4. Liquid stool
- 13. Which of the listed above can't be a marker of satisfactory lactation?
 - 13.1. Child's weak sucking
 - 13.2. Well-exposed mammary gland's venous network
 - 13.3. Mammary gland size increase during the period of pregnancy
 - 13.4. Cylindrical breasts and well pigmented nipples
- 14. In which of the following weaning may be introduced?
 - 14.1. Absolute health of a child
 - 14.2. Vaccinations carrying out
 - 14.3. Defecations disorders
 - 14.4. Moving to some country with another climate
- 15. At which term is weaning introduced in artificial type of feeding?
 - 15.1. 2 weeks earlier
 - 15.2. 1 month earlier
 - 15.3. At the same time
 - 15.4. 1 month later
- 16. In which of the given below states the breast feeding is not contraindicated?
 - 16.1. The newborn's hemolytic disease
 - 16.2. Mother's acute psychical disorders
 - 16.3. Acute respiratory disease in mother
 - 16.4. Decompensated renal insufficiency in mother
 - 16.5. Severe birth trauma of a newborn in birth
- 17. In which of the given below states the breast feeding is contraindicated?
 - 17.1. Chronic syphilis
 - 17.2. Tuberculosis non-active form
 - 17.3. Anthrax
 - 17.4. Measles
 - 17.5. Chicken pox

18. Which factor can't be the reason of agalactia?
- 18.1. Stress in breast feeding mother
 - 18.2. Much carbohydrates in nursing mother's ratio
 - 18.3. Late applying a child to the breast
 - 18.4. Rare feedings
19. In which of the given below states mixed feeding is indicated?
- 19.1. Mother's anemia
 - 19.2. Allergic diathesis in a child
 - 19.3. Rickets
 - 19.4. Mother's hypogalactia
 - 19.5. Anxiety of a child
20. When are the breast milk fortifiers used?
- 20.1. In healthy full-termed newborns feeding
 - 20.2. In premature newborns feeding
 - 20.3. In hypotrophic full-termed newborns feeding
 - 20.4. In artificial feeding of newborns

Correct answers: 1.4; 2.1; 3.3; 4.5; 5.4; 6.3; 7.3; 8.2; 9.4; 10.4; 11.4;12.1; 13.1; 14.1; 15.3; 16.3; 17.3; 18.2; 19.4; 20.2.

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