

Introduction to Paediatrics

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Childhood

- Childhood is the most dramatic period in regards to growth and development of an individual
- Childhood can be broadly divided into:
 - Prenatal Stage
 - Postnatal Stage



Prenatal Stage

- Lasts 280 days = 40 weeks
- One fertilized cell develops into a full human being
- The prenatal stage is divided into:
 - The embryonic stage
 - The fetal stage



The Embryonic Stage

- Is the first 8 weeks of development
- Body parts are differentiated
- The bases for all organ and body systems are formed



The Fetal Stage

- Lasts from the 9th week of intrauterine life till birth
- The organs and body systems develop fully and start functioning gradually



Postnatal Stage

- Starts with birth and lasts till 18 years and 364 days of age
- Is divided into:
 - The Newborn Period
 - The Infant Period
 - The Toddler Period
 - The Preschool Period
 - The Schoolchild Period
 - Puberty and Adolescence



The Newborn Period

- Is the first 28 days of life, starting with birth
- Is divided into:
 - Early newborn period: The first 7 days of life
 - Late newborn period: The remaining first 21 days of life
- The body systems adapt for the extra uterine life



The Newborn Period

- The majority of major inborn developmental disorders manifest
- The consequences of perinatal pathologies manifest: asphyxia, infections
- Intrauterine pathologic states continue
- Tendency towards generalization



The Infant Period

- Starts from the 29th day of life and ends on the child's 1st birthday
- Is a period of dramatic somatic, neuropsychological and motor development



The Toddler Period

- Starts on the 1st birthday of a child and last until his 3rd birthday
- Is characterized by the gradual development of independence in a child



The Preschool Period

- Starts on the 3rd birthday of a child and lasts until his 6th birthday
- The Majority of children are capable of starting school attendance at the end of this stage



The Schoolchild Stage

- Starts after the 6th birthday of a child
- Children start attending school
- The end of this stage is not clearly limited
- This stage ends with the beginning of puberty



Puberty and Adolescence

- Starts with the beginning of pubertal development
- Ends with the completion of sexual maturity
- Puberty begins about 2.5 years earlier in girls than in boys
- A variable of ± 2 years is present



Puberty and Adolescence

- Puberty begins in average at age 10 in girls and 12.5 in boys
- Sexual maturity is usually reached within 2 to 3 years since the beginning of puberty
- Growth is usually completed 4 to 5 years since the start of puberty
- “Puberty” should be reserved for physical growth and changes
- Adolescence describes psychosocial development



Newborns

- A full term newborn weighs between 2500 and 4200 grams, measures 50 cm and has a head circumference of 34 cm
- Newborns are equipped with reflexes:
 - Rooting reflex
 - Suckling reflex
 - Grasp reflex
 - Plantar reflex
 - Moro reflex



Newborns

- Have developed hearing:
 - They prefer “speech” noise
 - They prefer higher frequency voices
 - Shouting frightens them
- Smell sense:
 - Helps them in orientating themselves in the environment
 - They turn away from bad smells
 - They recognize the scent of the mother



Newborns

- Taste preferences are present since birth:
 - They prefer sweet taste
 - They avoid bitter taste
- The retina is fully developed but accommodation of the eye lens is insufficient
- Fixation of and following moving objects with eyes starts by 2 months of age



Newborns

- They prefer watching:
 - A human face
 - Clear colors
 - Contrast colors



Psychosocial Development During the First Year of Life

- Crying is the main way of communication during the first few weeks of life
- After 12 weeks, crying decreases in frequency and is substituted by smiling, touching and mouth play
- During the first year of life, children recognize “reality” as their immediate surroundings



Psychosocial Development During the First Year of Life

- They start realizing the continuous existence of items between 9 and 12 months
- They start manipulating with items using “devices” by the second year of age
- They start changing periods of visual contacts with periods of turning their faces away by 3 to 6 months



Psychosocial Development During the First Year of Life

- Hide and seek games develop by 9 months
- Separation fear and fear of strangers develops between 8 and 9 months



Child Growth

- Karlberg suggested the ICP growth model:
- I = Infancy
 - Commences during the 2nd half of intrauterine life
 - Ends between 3 and 4 years of age
- C = Childhood:
 - Begins during the first year of life, mildly declines but lasts until the end of growth



Child Growth

- P = Puberty:
 - Represents additional growth accelerated by puberty
 - Accelerates until reaching the maximum growth spurt velocity and then slowly declines and stops upon ending of growth



Child Growth

- Weight:
 - Double the birth weight between 4 – 5 months of age
 - Triple the birth weight by 1 year of age
- Weight gain:
 - Infants weekly:
 - During 1st trimester: 150 – 200 g
 - During 2nd trimester: 150 g
 - During 3rd trimester: 100 g
 - Toddlers, preschool and school children: 2 kg/year
 - Puberty: 2.5 – 6 kg/year



Child Growth

- Head circumference:
 - At birth: 34 cm
 - By 6 months: 43 cm
 - By 1 year: 47 cm
 - By 3 years: 50 cm



Child Growth – Energy Requirements

- Daily energy requirement in the first year of life is 80 – 120 kcal/kg
- It decreases by 10 kcal/kg for each 3 years of life until reaching adult energy requirements



Energy Expenditure in Children

- During the first year of life:
 - 85 – 90% of energy is used for growth
 - 5 – 10% is used for motion and thermoregulation
- In children between 6 and 12 years energy is spent:
 - Basal metabolism ~ 50%
 - Growth ~ 12%
 - Physical activity ~ 25%
 - Loss of energy with the stools ~ 8%



Brain Development

- The human brain consists of 100 billion cells!
- The replication of neurons is completed prior to birth
- Organization of brain cells develops long after birth
- White brain matter increases and synaptic junctions develop



Brain Development

- Head growth ends by 10 years of age
- Growth of the little brain grey matter occurs latest and ends by 1 year of age
- The spinal cord grows through the neural channel till the 3rd month of gestation
- Myelinization of the brain ends by the age of 2 years



Motor Skills Development

- Development of grasp:
 - Begins between 3 and 4 months of age with palmar grasp
 - The thumb is included in the grasp by 5 months of age
 - Opposition of the thumb does not appear till the age of 7 months
 - Pincer grasp develops by 9 months of age



Motor Skills Development

- Independent sitting by 6 months of age
- Walking by 12 months of age (varies between 9 and 17 months)



Second Year of Life

- The beginning of independence
- The child begins to realize himself
- Empathy develops
- Myelinization is completed and all brain layers mature between 15 and 24 months of age
- Potty training after 18 months of age



Speech Development

- A child communicates since birth!
- Non-verbal stage
- At 2 months of age vocalization
- Between 6 and 10 months babbling
- Babbling reaches its peak at 12 months of age and culminates in saying a word clearly
- At 18 months of age he can use 20 – 50 words



Speech Development

- The passive dictionary develops more quickly than the active speech
- At 13 months he understands 20 – 100 words
- At the end of 2 years of age he puts words into sentences and describes his own activity



Preschool Age

- Children of this age are mostly egocentric
- “Magical thinking”, reaches its peak between 3 and 5 years of age
- The period of nightmares and fear of ghosts
- Children start playing cooperatively instead of in parallel



Growth in the Childhood Period

- During the first year of life, the infantile component loses its significance and growth is affected by genetics and growth hormone
- Starting the second year of life a child takes his place in the percentile chart
- At 18 months of age in girls and at 24 months of age in boys a child reaches half his adult height



Evaluation of Physical Growth

- Percentile charts
- Estimation of adult height of a child:
 - In boys: their paternal height and the maternal height increased by 13 cm
 - In girls: their maternal height and the paternal height decreased by 13 cm



Schoolchildren Age

- Development of sensor-motor coordination
- School is the centre point of their life



Puberty and Adolescence

- Main puberty physical changes:
 - Development of secondary sexual symptoms
 - Maturation and full functionality of the adrenals, ovaries and testicles
 - Maturation of the skeleton, muscles and adipose tissue
- The coordination of two hormonal systems:
 - Hypothalamus – Growth Hormone – IGF-I axis
 - Hypothalamus – Hypophysis – Gonads axis



Puberty in boys

- First symptom is the activation and growth of the testes before the 10th year of life
- Testes size increases from 1 – 3 ml to 15 – 25 ml
- The scrotum thins and darkens
- The penis enlarges
- Pubic hair develops



Puberty in Boys

- Mild gynecomastia is present in 70% of adolescent boys
- Penis enlarges from 6.2 cm to 13.2 cm
- The voice mutates
- Acne is common
- Muscle mass enlarges
- Shoulders widen



Puberty in Boys

- Pubertal growth spurt of 7 – 12 cm annually
- Growth in boys ceases between 17 and 18 years of age



Puberty in Girls

- First symptom is enlargement of the breasts, usually between 8 and 13 years
- Growth spurt of 9 cm/year, usually begins in the 10th year of life
- Pubic hair develops
- Menarche around 13 years of age
- Pelvis enlargement and development of subcutaneous fat tissue



Puberty in Girls

- After menarche, a girl grows an average of 7.5 cm
- Growth in girls ceases at about 15 years of age



Adolescence

- Abstract thinking develops
- Understands the relationship between action and reaction
- Egocentric perception of the world turns gradually into a sense driven one
- Introspection develops



Psychomotor development

- Movement changes during the first year of life from reflex driven to intentional motion
- Motor development occurs in a:
 - Head to toes direction
 - Proximal to distal direction
 - Ulnar to radial direction



Psychomotor Development Newborn

- On his back, while on abdomen asymmetric positioning of the head
- Pulling by the hands into seated position leads into dangling of the head
- While on the abdomen, he can raise his head for a brief time, arms flexed underneath the body, bottom is higher than the head



Psychomotor Development Newborn

- Held with his soles touching the ground, the newborn straightens and can do coordinated motion of the semi-flexed legs



Psychomotor Development Infant, 6 weeks

- While on the abdomen, symmetric extension of the back appears



Psychomotor Development Infant, 3 months

- While on back is lively, rotates head in both directions, hands are open, extremities are not as flexed as in newborns
- Starting 2 months of age he follows moving objects with his eyes, smiles at the mother, plays with his hands



Psychomotor Development Infant, 3 months

- Being pulled into seating position, the head keeps in line with the body, the lower extremities are flexed, the upper ones are extended
- On the abdomen, the head is erect to a 40 – 50°, elbows are pressure points, hands are open
- Standing, the child steps on his toes and can't keep his balance



Psychomotor Development Infant, 6 months

- While on back doesn't stay still, fidgets, turns to one side or the other, turns over on his tummy, raises head
- Being pulled into seating position, the head flexes, pulls upwards using his hands, flexes the trunk and the lower extremities



Psychomotor Development Infant, 6 months

- While on the abdomen, he holds his head straight in a 90° , upper extremities are extended, the child leans on open hands, lower extremities are abducted and semi-extended
- Being in a standing position, he leans on his soles, extends the lower extremities and can hold his own weight.



Psychomotor Development Infant, 9 months

- Doesn't stay on his back, turns on his side or tummy, sits by himself
- Laying down the extremities are extended
- Pincer grip develops
- On tummy, he can go on all fours
- Can pull himself up while leaning on solid objects



Psychomotor Development Infant, 12 months

- Only rests on his back
- Pulls himself upwards
- Crawls on all fours rapidly
- Standing he balances his weight and walks around furniture
- Independent standing by 1 year of age



Psychomotor Development Toddlers and Preschool Children

- Between 2 and 3 years of age climbing up and down the stairs
- Exchange of feet while climbing of stairs by 3 years of age
- Independent climbing of stairs without support by 4 years of age
- Standing on one leg without support by 3 years of age
- Jumping on one leg between 4 and 5 years of age



Development of Drawing

- 2 years: Imitation of a vertical line and a circle
- 2.5 years: Imitation of a horizontal line
- 3 years: Draws a circle
- 4 years: Draws a cross sign and a primitive figure
- 5 years: Draws a square
- 6 years: Draws a triangle and a dressed figure



Causes of Psychomotor Development Disruption

- Perinatal or early postnatal damage
- Perinatal hypoxia
- Perinatal bleeding into the CNS
- Hyperbilirubinemia
- Infections
- Disorders of the acid-basis balance



Cerebral Palsy

- Damage to the central nervous system
- Manifests as a chronic disorder with stationary dynamics
- Often in conjunction with mental retardation
- Prevalence: 2 in 1000 people



Cerebral Palsy

- Classification:
 - Spastic hemiplegic
 - Spastic diplegic
 - Spastic quadriplegic
 - Athetoid form of cerebral palsy



Vital functions in children



Heart rate in children

Age in years	BPM
< 1	110 – 160
1 – 2	100 – 150
2 – 5	95 – 140
5 – 12	80 – 120
> 12	60 - 100



Breathing rate in children

Age in years	Breathing rate
Newborns	60
< 1	30 - 40
1 - 2	25 - 35
2 - 5	25 - 30
5 - 12	20 - 25
> 12	15 - 20



Systolic blood pressure in children

Age in years	Systolic BP
Newborns	50 – 70
< 1	70 – 90
1 – 2	80 – 95
2 – 5	80 – 100
5 – 12	90 – 110
> 12	100 - 120



Thank you for your attention!

