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# *Textbook of*
# PEDIATRIC NURSING



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# 3

# Growth and Development of Infants

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## INTRODUCTION

Infancy is a period of rapid and remarkable changes in growth and development as compared to any other period throughout life. It is exciting to observe the child in the first year of life. Lot of care, understanding and observation are needed during this period. Throughout the periods of growth and development, children need the parents or care takers to survive. Parents must learn to observe the infant's behavior and try to fulfill his needs. Parents are prepared adequately to understand the infant's development and they need guidance to meet the infant's needs. Caring the infant with joy has lot of significance on his wellbeing. Parents and nurses must pay attention to individual differences to meet the needs of each infant adequately. All aspects of growth and development, such as physical, psychosocial or emotional, psychosexual, spiritual, intellectual or cognitive, moral, language and speech, all interact and affect the other in the normal advancement towards maturity.

## PHYSICAL OR BIOLOGICAL DEVELOPMENT

Growth is very rapid during infancy, especially during the first six months.

### Weight

Infants gain 150 to 210 g (5–7 ounces) weekly until 5 to 6 months; and this is the time when the infant's weight doubles.

**Table 3.1:** Weight gain in infants

| *Age* | *Weight gain* | |
|---|---|---|
| 0–3 months | 30 g/day | |
| 4–6 months | 20 g/day | Birthweight doubles by 5 months |
| 6–9 months | 15 g/day | |
| 9–12 months | 12 g/day | Birthweight triples by one year |

Weight gain is slow during the second 6 months. Breastfed babies gain less weight as compared to bottlefed babies.

*Formula for approximate average weight*

| *Age* | *Weight in kg* | *Weight in pounds* |
|---|---|---|
| 3–12 months | $\frac{\text{Age in months} + 9}{2}$ | Age in months + 11 |

### *Length*

Trunk is the fastest growing part during the first year (50%). Increase in length occurs mainly in trunk than in legs. Length increases

at a faster rate in the first six months than the second six months.

| | |
|---|---|
| 0–3 months | 3.5 cm/month |
| 4–6 months | 2.5 cm/month |
| 6–12 months | 1.5 cm/month |

Average height at six months is 65 cm and at one year, it is 75 cm (50%).

### Head

Head growth is also rapid. During the first six months, it increases at the rate of approximately 1.5 cm per month; but during the second six months increase is only at the rate of 0.5 cm per month. At birth, head circumference (HC) is about 34 cm and increases at two monthly increments of 4+3+2+1+1+1 which is otherwise stated as:

| | |
|---|---|
| 2 months | 38 cm |
| 4 months | 41 cm |
| 6 months | 43 cm |
| 8 months | 44 cm |
| 10 months | 45 cm |
| 12 months | 46 cm |

$$\text{Average HC (cm)} = \left(\frac{\text{length in cm}}{2} + 9.5\right) \pm 2.5$$

Posterior fontanel closes by 6–8 weeks. Closure of cranial sutures occurs. An increase in the head size shows the growth and differentiation of nervous system. Brain weight increases to two and a half times by the end of first year. Reflexes that influence motor development replace the primitive reflexes.

**Remember that young brain is a work in progress.**

### Chest

This assumes adult contour. Lateral diameter becomes larger than the anteroposterior diameter. By the end of first year, chest circumference approximately equals that of head. Heart grows slowly as compared to the other body parts. Weight of heart doubles by one year. Width of the heart is approximately 55% of chest width.

## CHANGES IN PHYSIOLOGIC SYSTEMS

### Integumentary

Skin secretes more lubricating sebum. Sweat glands begin to secrete after 1–2 months and assist in regulating body temperature. Skin becomes less sensitive to irritants. Lanugo sheds during the first year. Hair on head is replaced by new growth. Ability of skin to contract and shiver in response to cold increases. Shivering causes the muscles and muscle fibers to contract (thermogenesis) and generates metabolic heat. Accumulation of adipose tissue during the first 6 months serves to insulate the body against heat loss.

### Respiratory

Lung increases in size, respiratory rate slows down to around 30/minute. Respirations are stable and continue to be abdominal. Infant is more prone to respiratory problems than older children. Ability to produce mucus is diminished (humidification), volume of dead space is large, requiring infant to breath twice as fast as adult to provide needed oxygen. The close proximity of trachea to the bronchi and its branching structures transmits infectious agents from one location to another rapidly. In infants Eustachian tube is shorter and straighter. Anatomic closeness of throat to Eustachian tube and middle ear allows infection to ascend from the pharynx to middle ear; fluid gets trapped in ear and is potential for otitis media. Adding to it, the inability of infant's immune system to produce immunoglobulin A (1gA) in the mucosal lining provides less protection against infection. Respiratory tract obstruction is common due to small-sized airways.

### Cardiovascular

Heart rate slows down. It increases with inspiration and decreases with expiration

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(sinus arrhythmia). Blood pressure changes. Systolic pressure rises during the first 2 months. Diastolic pressure decreases during the first 3 months and then gradually rises. Blood pressure fluctuates with activity and exercise.

(**Note:** While checking blood pressure, if the cuff is small, it gives a falsely high reading of blood pressure and if it is too large, it would give low readings. The cuff should cover at least two-thirds of the length of the arm.)

Normal blood pressure during infancy is 80/50 mm of Hg ± 20/10.

Pulse rate: 130 ± 20.

## Hematopoietic System

Significant hematopoietic changes occur during infancy. Fetal hemoglobin (Hbf) is present for the first 5 months and adult hemoglobin steadily increases during the first half of infancy.

Fetal hemoglobin results in a shortened survival of red blood cells and thereby decreased number of red blood cells. High levels of fetal Hb suppress the production of erythropoietin by the kidney. It results in physiologic anemia at 2–3 months. Maternal iron stores gradually diminish by 5–6 months, leading to lowered Hb level by 6 months, which is another cause of anemia. When erythropoiesis is stimulated iron supplements are needed for the formation of hemoglobin.

## Fluid and Electrolytes

At birth, a term baby's total body water is about 750 mL/kg (75% of body weight). In adults, it is 550 mL/kg. As the percentage of body water decreases, the amount of extracellular fluid also decreases—from 40% at term to 20% in adulthood. As the extracellular fluid is composed of blood plasma, interstitial fluid and lymph, when the amount decreases, it predisposes the infant to a more rapid loss of total body fluid leading to dehydration.

Renal structures are also immature which also predispose the infant to dehydration and electrolyte imbalance. Urine is voided frequently. Specific gravity of urine is low (1.000 to 1.010). Body surface area is 2–3 times greater in proportion to weight than in adults, which leads to greater insensible loss.

## Nervous System

This shows marked growth both by increase in cell size and number in early months. Development of myelin begins in fetal life and continues throughout infancy. Reflexes which appear during infancy are:

- **Labyrinth righting (2 months):** Infant is able to raise head when in prone or supine position
- **Neck righting (3 months):** When the infant's head is turned to one side while in supine position, the shoulder, trunk and finally the pelvis will turn towards that side
- **Body righting (6 months):** Turning hips and shoulders to one side causes all other parts to follow
- **Otolith righting (7–12 months):** When body of an erect infant is tilted, head returns to upright, erect position
- **Landau (6–8 months):** When infant is suspended in horizontal prone position, head is raised with legs and spine extended
- **Parachute (7–9 months):** When infant is suspended in horizontal prone position and suddenly thrusted downward, hands and fingers extend forward as if to protect himself from falling.

## Digestive System

Though the digestive processes are immature at birth, human milk has properties that compensate for decreased digestive enzymatic activity. Thus, breastfed babies receive optimum nutrition during first several months. Drooling occurs in early infancy (3 months) due to poorly co-ordinated swallowing reflex.

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Enzyme amylase (ptyalin) is present in saliva. Digestion in the stomach is mainly due to hydrochloric acid and enzyme rennin which acts on the casein in the milk (milk protein).

Digestion continues in the duodenum. Pancreatic enzymes and bile act on protein and fat. Enzyme amylase which is needed for the complex carbohydrate digestion is deficient until 4–6 months. Enzyme lipase is also limited reducing fat absorption till 4–5 months of age. Cardiac sphincter is more relaxed leading to frequent vomiting. Due to immaturity of intestinal tract, peristaltic waves may go reverse leading to vomiting. Immaturity of gastrointestinal tract (GIT) is evident in the appearance of stools. Stool is relatively loose as food passes rapidly from digestive tract. GIT also lacks immunological characteristics leading to GIT infections. Solid foods like peas, corn, etc. are passed incompletely broken down in the feces. Stomach also enlarges to accommodate greater volume of food. Any type of gastric irritation may cause diarrhea, vomiting and dehydration.

Liver function is most immature in the gastrointestinal organs. Bilirubin conjugation and bile secretions are achieved after a few weeks but other functions like gluconeogenesis, formation of plasma proteins and ketones, storage of vitamins and deamination of vitamins remain immature throughout infancy. Eruption of teeth helps in introduction of solid foods.

### Sensory Experiences

- **Vision:** Though the eyes are well developed, muscles attaching to socket are weak. Things cannot be seen clearly until these strengthen (2–3 months). Visual acuity gradually improves, binocular fixation begins by 6 weeks and well established by 4 months. Depth perception (stereopsis) begins to develop by 7–9 months but it does not develop fully until 2–3 years of age. Till this time, the child is at risk of falling.
- **Hearing:** Liquid from middle ear (liquid from perinatal sac) drains out in several days after birth and the baby is able to hear clearly afterwards. With myelination of auditory pathways, specific sounds are located.
- **Skin:** Skin is thinner, hence sensation of temperature, pain and touch are more.
- **Smell:** As no hairs inside nose odors get to smell cells easily and has excellent sense of smell.
- **Taste:** Taste buds though present at birth, are well developed only by 3 months

### Immunologic System

Maternal immunologlobulin G (lgG) confers immunity for about 3 months for antigens which the mother was exposed. During this time infant begins to synthesize its own lgG. Production of lgM reaches to adult level by 9 months. IgA is present in large amounts in colostrum which confines protection to mucous membrane of gastrointestinal tract against *E. coli*, rubella virus, poliovirus, enterovirus, etc. Secretory lgA is found in saliva and tears by 2–5 weeks. Lymph tissues, tonsils and adenoids grow steadily throughout first year.

## PSYCHOSOCIAL DEVELOPMENT

According to Eric Erikson phase I (0–1 year) is a period when the infant acquires a sense of basic trust. The trust acquired is foundational for the succeeding phases. Infants get a feeling of physical comfort and security. For the achievement of this task the quality of mother-child relationship is very crucial. Infant needs to overcome the sense of mistrust. Mouth is an important center for the acquisition of trust. Erikson described two stages in oral phase.

***First social modality is basically oral:*** Food intake is the most important activity during the first 3–4 months. When he acquires better control of bodily processes (e.g. vision, motor

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movements), he learns delayed gratification and failure leads to mistrust.

***Next social modality involves reaching out to others through grasping:*** Grasping is reflexive in the initial stage but it has social meaning to the parents. Tactile stimuli is very essential for acquiring a sense of trust. Quality interpersonal relationships influence the development of trust. During this stage active and aggressive biting occurs. He holds what is his own and has control over the environment. Cuddling, singing and talking to the infant help to develop intimacy and trust.

## COGNITIVE DEVELOPMENT

According to Piaget infant is in sensorimotor stage. Cognition is based mainly on the child's actions. Crucial events during this phase are:

- A key concept at this stage is that of "object permanence"—the ability to understand that an object continues to exist even when it is out of sight. A 12 months old infant will continue to look for an object even if somebody hides it. This helps in brief periods of separation with caregivers.
- Infant learns to separate himself from other objects in the environment. There is a progress from ID stage to ego stage.
- Ability to make symbols or mental representation. This allows infants to think of an object or situation without actually experiencing it.

### Substages

- **First stage (Birth to one month):** This stage is identified by rise of reflexes. During this phase individuality and temperament are expressed through reflexes such as sucking, rooting, grasping, etc. When baby cries with hunger—nipple put in the mouth—baby sucks—satisfied and sleeps.
- **Primary circular reaction (1–4 months):** In this phase voluntary acts replaces reflexive behavior. Reflexes become deliberate acts that elicit certain responses, e.g. infant associates nipple with sound of mother, ceases the cry when he hears mother's voice.
- **Secondary circular reaction (4–8 months):** Primary circular reactions are repeated and prolonged for the response that results. Grasping and holding now becomes shakings, banging and pulling. By second half of the first year infant can imitate sounds and simple gestures. Play become evident and 'object permanency' occurs.
- **Coordination of secondary schemata and its application to new situations (8–12 months):** Infants add new intellectual skills on the foundations of previous behavioral achievements. Motor skills increase which allow exploration of the environment. Intellectual reasoning begins (search for objects) and it begins to associate symbols with events (saying 'tata' when father goes out). During these four stages, infants learn through sensation and movement. (Other two substages are discussed in the chapter Growth and Development of Toddlers).

## PSYCHOSEXUAL DEVELOPMENT

Psychosexual development arises from birth. According to Sigmund Freud, the source of bodily pleasure is concentrated in the zones around mucocutaneous junctions. These erotogenic zones change as child matures. Infant's erotogenic zone is mouth. Gratification of id is derived through oral satisfaction. During the first 6 months, the child is in **oral passive** (oral dependent) stage which is evidenced by sucking. During the second half of infancy, teeth erupt and infant enter into **oral aggressive** stage with biting and sucking as the means of gratification. Infants receive sensations from the total surface of their bodies through activities such as cuddling, stroking, caressing, etc. The touching of infants plays an important role in the sexual development. All children love to be loved by adults and love to be carried by adults, love to be taken care of.

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## SPIRITUAL DEVELOPMENT

Fowler identified that infants are in undifferentiated stage and they have no concept of right or wrong. Faith is established through the development of basic trust with their primary caregivers.

## MORAL DEVELOPMENT

Infants belong to preconventional stage (Kohlberg). For an infant, good is what he likes and wants. He has no concept of basic moral order.

## SOCIAL AND EMOTIONAL DEVELOPMENT

Alongside cognitive development, infants are developing both socially and emotionally. It has been recognized for years that children brought up in institutions away from their natural parents often develop serious and subtle problems in social interactions and emotional development. Selective attachment is evident as memory develops in the first year of life and as the infant is able to express emotions and can move around independently. This is expressed by getting upset at leaving caretaker or by fear of strangers by 6–8 months onwards.

## ADAPTIVE BEHAVIOR

This helps an infant to respond and to cope with the environment. They are classified into:

### Gross Motor

It includes developmental maturation in posture, head balance, sitting, creeping, standing and walking.

#### *Head Control*

Newborn lies in flexed position. Marked head lag is noticed when the baby is pulled from lying to a sitting position. Turns head from side to side when in prone position. Makes crawling movements when prone to flat surface. By three months, infants can hold their head beyond the plane of the body. It can raise chest supported on forearms when in prone position. It is able to hold head erect and steady. By 4 months, infants can lift head and shoulders at a 90-degree angle when on abdomen and looks around. By 4–6 months head control is well established. Head holding at 4 months both on the tummy and on the back assures normal development. CDC has developed grading for head holding.

***Grading***

| | | |
|---|---|---|
| Head holding | : | Completed 4 months |
| Grade 0 | : | No head holding at all |
| Grade I | : | Head erect and steady momentarily |
| Grade II | : | Dorsal suspension—lifts head along |
| Grade III | : | Prone position—elevates on arms, lifting chest |
| Grade IV | : | Holds head steady while mother moves around |
| Grade V | : | Head balanced at all times |

***Interpretation***

| | | |
|---|---|---|
| Grade 0, I, II | : | Abnormal for that age |
| Grade III, IV, V | : | Normal for that age |
| Grade 0 | : | Means poor developmental status |
| Grade V | : | Means better developmental status |

If a baby has apparently Grade III head holding (only lifting head without raising on



**Fig. 3.1:** Infant with no head control

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**Fig. 3.2:** Infant with head control Grade V



**Fig. 3.3:** Infant sits with the back straight

arms) without grade II, this is to be considered abnormal because this may be due to neck extensor hypertonia.

### *Rolling Over*

Ability to roll (turn) from abdomen to back wilfully occurs at 5 months and from back to abdomen at 6 months. When infants are put to sleep on this side they may turn over to prone position with face down putting them at high-risk for sudden infant death syndrome (SIDS). But infant should be put in prone position while awake to enhance achievement of head control, crawling, creeping, turning over, etc. Parachute reflex which is a protective response to falling appears at 7 months.

### *Sitting*

Once the head control is achieved and the back straightens, the child is able to sit. Convex cervical curve develops when the head control is achieved. Likewise convex lumbar curve develops when the child sits. By the age of 6–7 months, the child is able to sit alone leaning forward on his hands for support. He can sit without support by 8 months. At about 10 months, the infant can sit from a prone position.

***CDC Grading***

| *Sitting* | | *Completed 8 months* |
|---|---|---|
| Grade 0 | : | No sitting at all |
| Grade I | : | Sits momentarily |
| Grade II | : | Sits 30 seconds or more leaning forward |
| Grade III | : | Sits with the child's back straight |
| Grade IV | : | While sitting, can turn around and manipulate a toy |
| Grade V | : | Raises self to sitting position. |

***Interpretation***

| | | |
|---|---|---|
| Grades 0, I, II | : | Abnormal for that age |
| Grades III, IV, V: | | Normal for that age. |

### *Movement*

The child acquires an ability to bear weight first, then he creeps with four extremities followed by standing with support and afterwards he walks alone. By 8 months, he is able to stand with support. He then creeps on hands and knees by 9 months. By 11 months, he is able to walk with support. By the age of one year, he stands alone for variable length of time. He is able to sit down from the standing position. He may take a few steps without support.

***CDC Grading***

| *Standing* | | *Completed 12 months* |
|---|---|---|
| Grade 0 | : | Not standing well |
| Grade I | : | Stands holding on to a furniture momentarily |
| Grade II | : | Take a few steps with the support of both the hands |

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**Fig. 3.4:** Grade IV—infant standing with support

Grade III : Can stand alone with legs apart
Grade IV : Come to the standing position with the support of a stool
Grade V : Without support he takes a few steps.

***Interpretation***

Grades 0, I, II : Abnormal for that age
Grades III, IV, V : Normal for that age
Grade 0 : Poor developmental status
Grade V : Better developmental status.

## Fine Motor

Grasping is a fine motor activity in which hands and fingers are used for "grasp" or prehension of objects. At 2–3 months, grasp occurs as a reflex but later it becomes voluntary. Newborn keeps the hands closed, whereas they are mostly open after 3 months of age. By 4 months, hand regard is common because of limitation of symmetric positioning that prevents infants from exploring the periphery. By 5 months, infant is able to grasp the objects voluntarily.

By 8–9 months, palmar grasp is replaced by crude pincer grasp. By 11 months, it progresses to a neat pincer grasp.

Infants can manipulate many things by 6 months, e.g. holding the bottle, grasping feet and keeping into his mouth, etc. Infant is able to transfer objects from one hand to another by 7 months. He picks up very small objects like seeds, sand using well-established pincer grasp by 10 months. At about 11 months, he can even put objects into a container and remove them back.

### *Developmental Observation Card (DOC)*

DOC is developed at Child Development Center, Thiruvananthapuram, Kerala which can be used effectively for assessing the major milestone. Developmental disabilities are noticed in children who had no apparent risk factors. It is always ideal to have some sort of developmental evaluation for all babies. This developmental observation card can be used by the parents. The large majority of developmental delays could be identified using cut off points for 4 simple developmental milestones.

**DOC**—major milestones:

- ***Social smile:*** Achieved by completed 2 months (baby smiling back in response to your smile)
- ***Head holding:*** Achieved by completed 4 months (keeping head steady when baby is held upright, lifts head and shoulder supported on forearm in prone position)
- ***Sitting alone:*** Achieved by completed 8 months (baby is able to sit alone with back straight without support)
- ***Standing alone:*** Achieved by completed 12 months (baby is able to stand bearing weight on both the legs with minimal or no support).

Those who fail these simple milestones, must have a formal developmental assessment. (*Courtesy:* CDC, Thiruvananthapuram, Kerala, India.)

## ASSESSMENT OF VISION IN EARLY INFANCY

Anybody (including mother) who comes in contact with the baby should make sure that

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the baby can see, hear and listen. An infant with visual and hearing impairment from birth may develop developmental delay due to lack of orientation, mobility and experiences, if not supported adequately. Hearing and visual impairment affect all areas of development as the child's awareness and interaction with the environment are limited.

**Make sure that the child can see, hear and listen**

### *Visual Development*

At birth : Follows moving objects with his eyes
3–4 weeks : Watches mother when she speaks
4 weeks : Can follow in a range of 90 degrees
4–6 weeks : Smiles at mother's face
3 months : Follows a range of 180 degrees and can fixate near objects
4 months : Can fix his eyes on an object
5 months : Excited when his feed is prepared
6 months : Adjusts his position to see objects, also bends to see objects.

A child needs to be checked for these visual developments.

## Hearing Assessment

Ear is fully developed at birth—sound perception is possible in uterus itself. Recognition of voice and speech perception is present shortly after birth. Language development begins at birth. Babies mimic what they hear.

According to Murphy, sequence of development of sound localization is described when a sound is made approximately 18 inches from the ear.

### *Hearing Development—Milestones*

2 months : Startles to loud noises
3 months : Turns head to the side to which the sound is heard
4 months : Looks for sound with his eyes, starts babbling
5–6 months : Turns head to one side and then downwards if the sound is made below the ear
6 months : Turns head to one side and then upwards when sound is made above the ear level; begins to imitate speech sounds
6–8 months : Turns head in a curving arc towards the sound source. Imitates speech sounds of others
8–10 months : Head is diagonally and directly turned towards the sound—understands ' No', 'bye bye', etc.
12 months : Locates sound in all directions, responds to singing, music.

Baby initiates sound by 6 months. By 7 months, he may respond to his name. By 9–12 months, he knows the meaning of several words. By first year, he can localize a sound source as good as older children.

**Babies cannot speak if they cannot hear**

If hearing problems are undetected, it will cause problems with speech, language and cognitive development.

The best age for a formal hearing test is 8–10 months and not before 6 months or after 15 months. All babies should have a formal hearing test at 8 months of age.

Following things can stimulate a baby:

- **Love your baby:** Never deny the baby's need for your love. Give them adequate love and affection which creates a strong self-esteem and increased development of brain circuitry
- **Talk to your baby:** It has lot of positive effects on the baby

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- **Touch your baby:** Cuddle the baby, caress the baby and let him feel your warm touch. While carrying the baby, keep him closer to your chest so that the can feel your heartbeat
- **Respond to your baby's needs:** It develops a sense of trust and emotional stability
- **Encourage imitation:** The baby is observing you and miming your voice and facial expressions
- **Let your baby experience different surroundings:** Go for a walk with him, show him places, birds, plants, etc.
- **Let your baby explore** different textures and temperatures (not too extreme), provide safe environment
- **Read books:** Baby enjoys pictures, your facial expressions, etc.
- **Play music for your baby.**

(*Courtesy:* CDC module on early stimulation.)

## COMMON PLAY BEHAVIOR IN INFANTS

### Sensorimotor

This is the earliest form of play. Infant enjoys sucking, moving fingers, kicking, babbling, rolling, etc.

### Exploratory

This type of play occurs when hand co-ordination develops. He plays with his sex organs, sucks the toes and fingers, pulls, pushes, throws toys, etc.

### Social

In this type, an infant enjoys others talking to him, singing or reading for him.

### Games

The infant shows excitement and happiness while playing games like 'hide and seek'.

(See chapter—Play Needs in Children for more details).

## EARLY DEVELOPMENTAL STIMULATION

### Infant Stimulation Programs

Interventional therapies for babies at risk for developmental delay—It can be done for periodical developmental assessment in motor, cognitive and language development.

### Aims

- To stimulate the child to pass through normal developmental periods
- To prevent developmental delay
- To prevent asymmetries and abnormalities
- To prevent atrophy of muscles
- To prevent contractures of joint
- To prevent fixity of joints
- To decrease muscle tone
- To prevent tendon tightening
- To detect abnormalities.

From the time of birth, a baby's personality begins to evolve. All babies need to be cuddled and stimulated. Stimulation is important for the growing brain and body and it plays an important role in the child's development. Mother is the greatest contributor in early stimulation. Mother also has more opportunities to influence the child's psychological growth and behavior. Mother's educational status and past experiences influence development.

*Remember*

All babies need stimulation to grow physically for the cognitive and intellectual development.

All at-risk babies should be provided with early stimulation in a planned systematic manner.

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Avoid overstimulation.

Playing is important for the growth and development of children.

## INFANT AT A GLANCE

- Average birth weight 2.5–3.5 kg
- Birthweight doubles by 5–6 months and triples by one year
- Height at birth is 50 cm
- Average height at one year is 75 cm
- Head circumference is 33–35 cm at birth and 46 cm at one year
- Head circumference and chest circumference equal by one year
- Posterior fontanel closes by 6–8 weeks
- Vital signs:
  - Blood pressure 80/50 mm of Hg + 20/10
  - Respiratory rate 50/minute
  - Pulse rate 50/minute
- Protective reflexes that appear during infancy are: Labyrinth righting, neck righting, body righting, otolith righting, Landau and parachute reflexes
- Vision: Binocular vision well established by 4 months
- Psychosocial development (Erik Erikson): Trust vs mistrust
- Cognitive development (Piaget): Sensory motor stage (stages 1–4): Object permanence
- Psychosexual development (Freud):
  - Oral passive 1–6 months
  - Oral aggressive 6–12 months
- Moral development (Kohlberg): Preconventional stage
- Spiritual development (Fowler): No concept of right or wrong
- Social development: Selective attachment
- Gross motor development:
  - Head control 3–4 months
  - Rolling over 5–6 months
  - Sits alone 6–7 months
  - Stands alone 9 months
  - Walks with support 10–11 months
  - Independent steps 1 year
- Fine motor development:
  - Voluntary grasp 5 months
  - Crude pincer grasps 8–9 months
  - Neat pincer grasps 11 months
- Dentition: First tooth to erupt at 6 months are central lower incisors.

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**Table 3.2:** Average achievement levels of infants

| *Age* | *Physical or biologic* | *Motor* | *Sensory* | *Language* | *Socialization* |
|---|---|---|---|---|---|
| 1 month | Average weight: 4.4 kg, an increase of 150–210 g/week.<br>Length increases–2.5 cm/month (53 cm).<br>Head circumference: 1.5 cm/month (35.5–36 cm)<br>Pulse 130 ± 20–Resp 35 ± 10<br>Blood pressure 80/50 ± 20/10<br>Reflexes—sucking, rooting, swallowing, extrusion | **Gross motor:** Flexed position with pelvis high. Head lags when pulled from supine to sitting position. Turns head side to side when prone. Crawling movements when prone on flat surface.<br>**Fine motor:** Hands closed. Palmar grasp strong. | Startles on sound. Able to fix on moving objects. Blinking in bright light. Quiets when hears voice. | **Expressive:** Cries to express displeasure. Makes small throaty sounds. Cries when hungry; begins to coo.<br>**Receptive:** responds to human voice. | Beginning to develop trust.<br>Negative counterpart—mistrust.<br>Egocentric.<br>Total dependence on caregivers.<br>Eye contact.<br>Smiles.<br>Good bonding. |
| 2 months | Posterior fontanel closes by 6–8 weeks<br>Crawling reflex disappears.<br>Grasp reflex fades | **Gross motor:** Assumes less flexed position when prone<br>Less head lag when pulled to sitting position<br>Lifts head in 45 degrees from flat surface when in prone position—turns from side to back<br>**Fine motor:** Hands open.<br>Grasps reflex fading. | In supine position he can follow dangling object from side to beyond midline.<br>Searches to locate sounds.<br>Turns head to side when sound is made at ear level. | **Expressive:** Cry pattern differentiated—varies with reason, e.g. hunger, sleep, etc.<br>Coos.<br>Responds to caregivers.<br>**Receptive:** Quietens by hearing caregivers' voice<br>Alert expression when listening. | Distinguishes mother/caregiver from others.<br>Sense of trust develops.<br>Eye-to-eye contact.<br>Smiles back.<br>Cries to get attention. |

*Contd...*

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