

Developmental assessment by Asma hadida



2015_2016

Fields of development

There are four fields of developmental skills to consider whenever a young child is seen. **These are:**

- gross motor .
- vision and fine motor.
- hearing, speech and language.
- Social, emotional and behavioral.



Gross motor skills are the most obvious initial area of developmental progress. **As fine motor skills** require good vision, these are grouped together; similarly, **normal speech and language** development depends on reasonable **hearing** and so these are also considered together. **Social, emotional and behavioural** skills are a spectrum of psychological development.

The acquisition of developmental abilities for each skill field follows a remarkably constant pattern between children, but may vary in rate.

A deficiency in any one skill area can have an impact on other areas. a hearing impairment may affect a child's language, social and communication skills and behaviour. As a child grows, additional skills become important, such as attention and concentration and how an individual child manages to integrate his skills.

Developmental milestones

- **Limit ages** are the age by which they should have been achieved. **Limit ages are usually 2 standard deviations from the mean.** They are more useful as a guide to whether a child's development is normal than the median ages. Failure to meet them gives guidance for action regarding more detailed assessment, investigation or intervention.

Developmental assessment by Dr. Asma Hadida

When considering developmental milestones:

- **median age** is the age when half of a standard population of children achieve that level; it serves as a guide to when stages of development are likely to be reached but does not tell us if the child's skills are outside the normal range.



Variation in the pattern of motor development

Which crawling style does your baby use?



There is variation in the pattern of motor development between children. Most achieve mobility by crawling (83%), some bottom-shuffle and others crawl with their abdomen on the floor, so-called **commando crawling** (creeping).

A very few just stand up and walk. The locomotor pattern (crawling, creeping, shuffling, just standing up) determines the age of sitting, standing or walking.

Adjusting for prematurity

If a child has been born preterm, this should be allowed for when assessing developmental age by calculating it from the expected date of delivery. Thus the anticipated developmental skills of a 9-month baby (**chronological age**) born 3 months early at 28 weeks' gestation are more like those of a 6-month baby (**corrected age**). Correction is not required after about 2 years of age when the number of weeks early the child was born no longer represents a significant proportion of the child's life.



Is development normal?

- Concentrate on each field of development (gross motor; vision and fine motor; hearing and speech/language; social, emotional and behavioural) **separately**.
- Consider the pattern of development reached by thinking longitudinally about each developmental field. Ask about the sequence of development already achieved.
- Determine the stage the child has reached for each skill field.
- Relate the progress of each developmental field to the others.
- Then relate the child's developmental achievements to his age (**chronological or corrected**).

This will enable you to decide if the child's developmental progress is **normal or delayed**. If there is developmental delay, does it affect all four developmental fields (**global delay**), or one or more developmental field only (specific developmental delay)? As children grow older and acquire further skills, it becomes easier to make a more accurate assessment of their abilities and developmental status.

حدد العمر من كل ناحية بروحها بعدين قارنهم ببعض بعدين
قارن بعمر الطفل
لو لقيت تأخر حدد لو في حاجة واحدة ولا في كل شي وبعدين
تسال في D.D

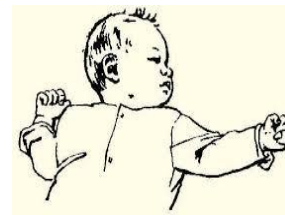
Cognitive development

Some primitive reflexes present at birth. (These should disappear by 4-6 months)

Reflex - mode of eliciting it	Description
Moro - sudden head extension.	Symmetrical extension, then flexion of all limbs.
Grasp - an object is placed in the palm at the base of the fingers.	Flexion of the fingers of the hand.
Rooting - stimulus near the mouth	Turning of the head towards the stimulus
Placing - infant held vertically and the dorsum of the feet brought into contact with a surface.	Lifts first one foot, placing it on the surface, followed by the other.
Positive supporting reflex - infant held vertically, feet on a surface.	Legs take body weight, may push up against gravity.
A tonic neck reflex (ATNR) -	Infant adopts a 'fencing' posture,

lying supine, the head is turned by the examiner to one side.

with the arm outstretched on the side to which the head is turned.




- **gross motor development:** an explosion of skills during the first year of life.
- **vision and fine motor development:** more evident acquisition of skills from 1 year onwards.
- **hearing, speech and language:** a big expansion of skills from 18 months
- **social, emotional and behavioural development:** expansion in skills is most obvious from 2.5 years.

Developmental questioning needs to cover the whole area of developmental progression but this more focused way of taking a developmental history allows a quicker and more appropriate assessment. It directs the assessment to current abilities instead of concentrating on parents trying to remember the age when their child acquired developmental milestones sometime in the past.

Equipment for developmental testing


- Simple basic equipment is all that is needed for most developmental assessment.
- Equipment is aimed at bringing out the child's skills using play. Cubes, a ball, picture book, doll and miniature toys such as a tea-set, crayons and paper.

Developmental assessment steps




Before the examination of the four areas, history must be taken from the mother: when the child sits? Smile? Walk? Also ask the mother about any antenatal or postnatal problems which may interfere with developmental e.g. infection, birth asphyxia.

General examination



Comment on any dysmorphic features "any child who doesn't look normal when compared to other Children".
Measure the OFC "gives an idea on the brain development, child's behavior."

In the exam:

- 
- ✓ Ask mother the name of the child and call the child with it.
 - ✓ Start by inspection:
E.g. the child is sitting without support.
Keep child and mother comfortable: do not stand pt. till you complete thing of sitting "do not go systemic"
Keep small paper beside you and write short note.
Give a **range** do not give specific age, even if you know age of the child.
Initial age of development assessment is 6 weeks and after 6 years it will be dependent of school performance and intelligence.
After finishing gross motor, fine motor, speech and social you may do **primitive reflexes** to help you know the age.
Hearing test.

Developmental assessment by Dr.Asma Hadida

Age	Gross motor	Fine motor and vision	Social	Language and hearing
Newborn	Prone : flex knees under abdomen and rotate head to side "term ",preterm : will lie flat with flexed knees but not under the abdomen .	Follow the object from midline through range less than 45c from birth to one month , follow from midline to 90c from one month to 1.5 month and turn to light also .		Cries . Respond to sound .
6weeks	Prone : raises abdomen up head briefly , knees not under abdomen "hip extended " . Ventral suspension: the head will be at same level with the body briefly		Social smiling	
3months	Prone : bears his weight on his forearms "flex UL" so lead to raise the head above level of ground "head support " . Ventral suspension : head control ., and pulling to sit ,	Follow object from midline through range of 180c , hold rattle if placed in his hands , grasp reflex , 4_5m can reach small object ,	Smiles spontaneously , react with excitement , and stares to his one hand and laugh .	Quietness to voice and stares, turn to sound at level of ear , bubbling ,
6month	Prone : bears his weight on his hands with extended arms and raise of head and chest . sits supported 5m : rolls supine to	Handing object and transfer from hand to hand to mouth(mouth ing)	Recognize mother , displeasure if toy removed	Turn head to voice Say "ma , ba" , Turn to sound at 0.5 m

Developmental assessment by Dr.Asma Hadida

	prone .			
7months	Sit without support .	Shakes a rattle , bangs toys on table surface ,	Persistent to obtain toys out of reach	Da _Da and Ma_Ma sound
8months	Rolls from front to supine , sit without support with straight back .	Tries picking up with fingers .	Hold bottle	
9months	Crawling on the abdomen , stand with support , Roles back to front , pull to stand .	Can use thumb and fingers to pick cubs . Immature pencil grasp. Point with index fingers and looking for falling object . Very observant .	Responds to his name wary at strangers and become sensitive to separation from his mother , Feeding himself biscuit and also understanding NO and Bye Bye.	Da _Da , Ma_Ma, Turn to voice Do hearing destructive test .
10months	Creeps on hands and knees " walk around furniture " stand supported		Initiate waving bye bye	
11months	Stands unsupported .	Can pick small object.		
12months	Walk supported stand alone Sit from lying position .	Stops mouthing of objects , bangs 2 cups together . Mature pincer grasp	Wave bye bye. Eating by spoon Drink from cups and find hidden object . Clap hands .	Say 2_3words meaning also can respond to order
15months	Able to get up alone from sitting position . Walk alone steady ,	Linear scribbling and build tower of 2 cubs		
18months	Creeps down stairs and climbs up stairs step by step and push and pull toys	Circular scribbling and tower of 3 cubs . Point to the	Feeds independently Point to body part "nose	Says up to 20 words .

Developmental assessment by Dr.Asma Hadida

	and doors .	picture in the books . turn books on pages .	_mouth " . Symbolic play	
2years	Walks up and down stairs with 2 feet per step "immature " also kicks a balls .	Copies ventral line and tower of 6 .	Feeds with fork and spoon .	Says 2_3words in sentences , I ME
3yaers	Walks up stairs on foot per step and down with 2 feet also can drive tricycle .	Copies of circular and build tower 9 and a bridge	Able to use toilet wash hands and brush teeth	Able to tell full name , known sex male or female .
4years	Walk up and down stairs by one foot per step as adult .	Copies of cross line and build step of tower .	Able to undress and combing hair .	Mention address also count to 10 .
5years	Runs on toys and catch ball	4_5 yeas : draw a square . 5years : copies triangle .	Able to use knife and fork Able cloths and do large button	Ask about of words and who and when .



Growth

Definition :

Growth : increase in the size and number of cells it includes aspects as wt. , length , and HC .

Development : maturation of functions and gaining of various skills increase in complexity , it includes aspects as : motor development , mental development and sexual development .

Both growth and development go parallel to each other .



Growth stages :

Intrauterine stage :

Embryonic stage : the first 8 weeks .

Fetal stage : characterized by rapid growth and development .

Early : 9-24weeks .

Late : 25-40 weeks .

Extrauterine stage post natal :

Neonate : first 4 weeks of life " 28 days "

Infant : birth to 1y include :

Neonate : " birth to 28days "

post neonate : " 28days to 1year "

infancy period of most rapid physical growth and mental development .

preschool : 1-4years

school child "5-12years "

adolescence"12-20 years ":the period of passage from childhood to adulthood .

Fetal Growth From 8 to 40 Weeks



*** Factors affecting growth and development :**

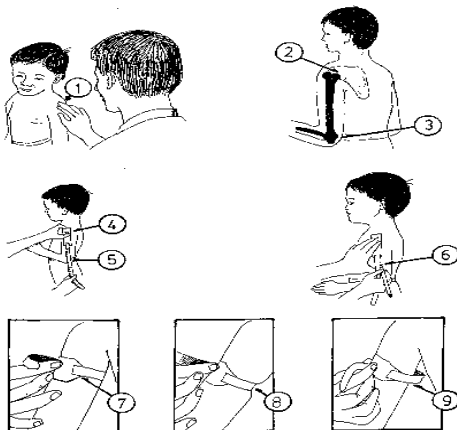
1. Genetic factor , race .
2. **Endocrinal factors :** the growth hormone, thyroid hormone and sex hormones are essential for normal growth and development.
3. **Environmental factors :** socioeconomic state , health of mother .
3. **Nutritional factors :** e.g PEM , cong . anomalies, physical factors, chronic disease. Imp.
4. Intelligent " **most important factor "**
5. **Sex :** girls grows faster than boys from 7m to 4y then equally .girls start puberty at younger age than boys .

Assessment of growth :

1. Anthropometric measurement .
2. Teething .
3. Osseous maturation .

Wt. : average 3-3.5 kg . there is an initial period of loss of wt. in the first 3-4days .
10 % due to fluid redistribution .

- ▶ **During the 1st 4months** : $3/4$ kg /m (4m double birth wt.).
- ▶ **2nd 4months** : 0.5 kg /month .
- ▶ **3rd 4 months** : 0.25kg /month (at 12m triple birth wt.)
- ▶ **During early childhood 2-6 years** : 2kg /years . (wt. = age in years \times 2+8)
- ▶ **During late childhood "6-12years "**: 2.5 kg /years .



Length and height :

Under 3years the length is measured in supine position .

Over 3years the height is measured in standing position .

- ▶ **At birth** : 50cm .
- ▶ **During the 1st year of life** :
- ▶ 3cm every month in the 1st 3months .
- ▶ 2cm every month in between 3-6months .
- ▶ 1.5 cm every month in between 6-12months.
- ▶ **1st year** : 75cm .
- ▶ **1y_2y** : 1cm /month .
- ▶ **After 2y = age in years \times 5+80 .**
- ▶ **Or 4years** : 100cm " double birth length " .
- ▶ **4_8y** : 7cm /year .
- ▶ **9_12y** : 5cm /year .
- ▶ **12year** : 150 cm " triple birth length " .

* HC :

At birth 35cm .
6m \rightarrow 43cm .
1y \rightarrow 47cm .
2y \rightarrow 49cm .
4y \rightarrow 50cm .
6y \rightarrow 51cm .
12y \rightarrow 53cm .

Upper /lower segment ratio :

Birth : 1.7 : 1 .
3years : 1.3 :1 .
5years : 1.25 :1 .
Puberty : 1:1 .

*Mid arm circumference :

- Normally is between 13.5 - 14.5cm in children 1-5y old .
- Those between 12.5 - 13.5cm have border line nutrition .
- Those below 12.5cm are overtly malnutrition.

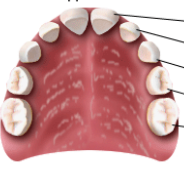

***Chest circumference :**

It is usually measured in mid respiration at the level of the xiphoid .
it is usually related to the head .

At birth ; the head is larger by 2cm

Between 1-2years : both are equal .

After 2years: the chest is larger than the head .

Baby Teeth			
Upper Teeth		Age Tooth Comes In (months)	Age Tooth Is Lost (years)
	Central Incisor	9.6	7.0
	Lateral Incisor	12.4	8.0
	Canine (Cuspid)	18.3	11.0
	First Molar	15.7	10.0
	Second Molar	26.2	10.5
Lower Teeth			
	Second Molar	26.0	11.0
	First Molar	15.1	10.0
	Canine (Cuspid)	18.2	9.5
	Lateral Incisor	11.5	7.0
	Central Incisor	7.8	6.0

☺ **Teething :**

Primary or deciduous teeth :

- Central incisors 5-7m
- Lateral incisors 7-9m
- 1st molar 10-16m
- Canines 16-20m
- 2nd molar 20-30m .

Secondary or permanent teeth :

- 1st molar 6y .
- Central incisor 7y .
- Lateral incisors 8y .
- 1st premolar 9y .
- Canines 11y .
- 2nd molar 12y .
- 3rd molar 18y .

Osseous maturation :

▸ **At birth :** ossify center around the knee joint are well developed .

▸ **In early childhood "2-6y " :** one ossify carpal center per year .

▸ **In late childhood and adolescence :** fusion of epiphysis .

Normally bone age corresponding to the age of the child .

Growth chart :

Growth chart :

Graphical method by which physical growth of the child can be assessed .
There is wide range variation among normal children of the same age .
Each child has his own inherited pattern of growth .

Types: the most imp . and commonly used are percentile GC .

Criteria :

Made for different aspects of physical growth : ht , wt , and HC .

Vary from : boys to girls , one country to another .

Each chart composed of 7 curves :

- 50th percentile _ average .
- 25th " _ below average .
- 10th " _ low normal .
- 5th " _ lowest normal .
- 75th " _ above average .
- 90th " _ high normal .
- 95th " _ highest normal .

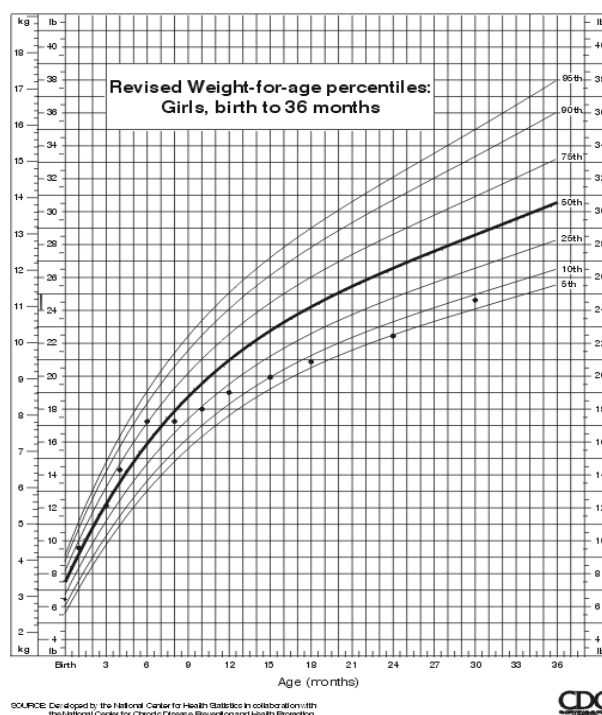
Normal child on percentile :

Should lie between the 5th and 95th percentile curve . one single reading values below 5th or above 95th are abnormal .

Should follow the same percentile level throughout the growth period .

One serial measurement deviation of the child from his own percentile curve is abnormal .

Case Study: Mary, Born Dec. 2, 1997



*Hearing destruction test in which 7-9m

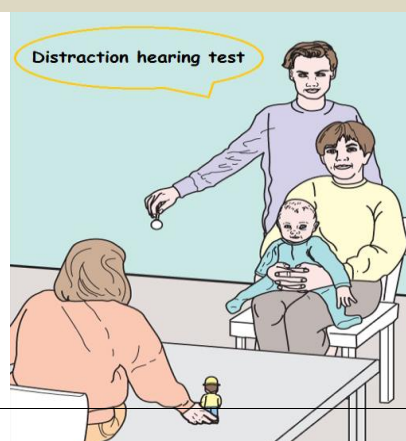
الطفل في حجر امه ويكون في شخص ثاني قدامه يلهي فيه باي حاجة بحركة بلعبة المهم مش بصوته ويأتي أحد من خلفه الطفل بحيث لا يراه عند مستوى أذن الطفل ويعمل:

► High pitched sound " spoon and cup "

► Low pitched sound يصفر اويهمس

لو سمع علي مستوي ٥,٠ متر عمره ٦ شهور ولو سمع علي مستوي متر عمره ٩ شهور ولو سمع علي مستوي فوق رأسه عمره سنة.

Normal hearing audiometry could be done at age of 4y .



N.B :

- ✓ **Parachot reflex "protective reflex "** : starting at 6-8m and will be mature at 9m and continuous for life.
- ✓ Pupil of newborn infant react to light since birth .
- ✓ Binocular vision develop in 1st 2years of life so squint is usually normal below
- ✓ 6m of age .
- ✓ The 1st 4m of life important period for retinal stimulation .
- ✓ Tears usually start at 4m of age "**child cry without tears before that "** .
- ✓ Full visual acuity will develop at 4y in which the child will able to do **E.snellen test**.

➡ **Causes of delayed walking :**

- Physiological delay "familial "
- PEM.
- Rickets.
- Cerebral palsy.
- Down syndrome , cretinism.
- Chronic systemic diseases .
- Muscle disease as cong. Myopathy.

➡ **Causes of delayed speech :**

- Physiological delay
- Deafness.
- Emotional and social deprivation.
- MR.
- Bilingualism "two language are spoken at home"
- Paralysis of muscle of articulation and tongue.
- Autism.

➡ **Causes of delayed smiling :**

- Lack of stimulation .
- Blindness.
- MR.
- Autism.

How to calculate IQ ?

$$IQ = \frac{\text{mental age}}{\text{chronological age}}$$

⇒ 70-75% border line

⇒ 50-70% mild learning difficulty

⇒ 35-50% moderate "

⇒ 20-35% sever "

⇒ <20% profound "total care "

Normal growth and puberty

➤ From birth to adolescence , *growth proceeds in biologically determined cycles that fall into 4 distinct periods* :

1. A rapid increase in length during the first 2 years .
2. A slow period from 2 years to preadolescence .
3. A rapid period from puberty to 15 or 16 years of age , during which the growth rate increase two folds to reach a peak (*the adolescent growth spurt*) .
4. A sharp deceleration in growth velocity until growth ceases at puberty , final height is achieved once there is bony fusion of the epiphysis .

➤ Growth normally ceases around 15 years in girls and 16 years in boys .

➤ One of the most powerful determinants for growth in the normal child , is the genetic

influence of the parents height . (*mid parental height percentile*) .

➤ **Puberty** : start in girls at 11.4 years and 12 years in boys .

Boys	Girls
Testicular growth	Breast development
Pubic hair	Pubic hair
Growth of penis and scrotum	Maturation of external genitalia
Muscle bulk increase	Female body habitus
Beard , axillary and body hair	Axillary hair
First seminal discharge	Menstruation

Boys genital development :

Stage 1 : testes , penis and scrotum as in early childhood.

Stage 2 : testes grow , skin of scrotum reddens and becomes coarser .

Stage 3 : penile enlargement , further growth of testes and scrotum .

Stage 4 : penis broadens , glans enlarges , and scrotal skin darkens .

Stage 5 : adult genitalia .

***Boys testicular volume :**

The pre- pubertal testes are 1-2ml in volume , increasing to 20-25 ml in the adult . a prader orchid meter can be used to assess volume .

Girls breast development:

Stage 1 : raised nipples only .

Stage 2 : breast bud development .

Stage 3 : further enlargement of breast and areola.

Stage 4 : projection of areola and nipple .

Stage 5 : nipple projects , areola flat , adult breast contour .

Pubic hair (both sexes) :

Stage 1: nil .

Stage 2: sparse growth of long hair .

Stage 3: hair darker , coarse and curlier .

Stage 4 : distribution limited to immediate surrounds of genitalia .

Stage 5: adult type and distribution .

► Abnormal growth and puberty :

Short stature :

many children will be seen to grow , in length normally below the 5th percentile (3% of population) . estimation of mid – parental height , will often clarify the situation. on other hand the following children need referral to a pediatrician :

1. children whose height is less than 90% of the 50th percentile for age (stunting) .
2. children crossing height centile in downward direction especially over 2 years .

➤ **Assessment of such short children involves a number of essentials :**

1. **history** : exclude social pathology and neglect , chronic illness e.g heart disease or malnutrition , and drugs e.g steroids .
2. **examination** :
 - dysmorphic features e.g down syndrome or turner .
 - disproportion e.g short limbs e.g achondroplasia .
 - fundus-papilledema /optic atrophy e.g craniopharyngioma .
 - evidence of systemic diseases e.g CHD.
 - Assessment of nutritional status e.g malnutrition
3. **basic investigation** : bone age .
4. **further investigations** : GH , pit. Function test .

classification of short stature:

a. Proportionate short stature

:

- Normal variant .
- Chronic malnutrition .
- CRF, cardiac and respiratory diseases .
- Endocrinal disorders.e.g. hypopituitarism .
- Chromosomal anomalies .

b. disproportionate short stature:

- rickets .
- achondroplasia .
- hypothyroidism .

➤ **Normal variant of short stature:**

- a. Constitutional growth delay .
- b. Genetic short stature (familial) .

a. Constitutional short stature :

Birth length is normal and infants grow normally for 4-12 m then linear growth and weight gain slow down , associated with bone age delay of <3years , the child grow at a normal velocity parallel to and to below the 3rd percentile line, but is small for parental height . the condition is often familial and is associated with delayed puberty .bone age remains

Developmental assessment by Dr.Asma Hadida

roughly equivalent to height age . growth will continue after 15-16 years when his / her peers have stopped growing , and the prognosis for a normal final height is good .

b. Genetic short stature (familial) :

This is a common cause of short stature and the parents will be found to have a low mid-parental height percentile . low birth length and normal age of puberty .

Causes of pathological short stature :

Fat child	Thin child (normal appearance)	Dysmorphic
Hypothyroidism	asthma	Turner syndrome
Growth hormone	Social deprivation	Down syndrome
Pseudohypoparathyroidism	Celiac disease	Prader-willi syndrome
Cushing syndrome	Cystic fibrosis	Skeletal dysplasia
Panhypopituitarism	Renal disease	

Tall stature (gigantism) :

The assessment is carried out as follows :

1. Plot measurement .
2. Calculate mid parental height percentile .
3. Exclude obesity .
4. Exclude dysmorphic syndrome e.g.marfans syndrome , klinefelters syndrome and cerebral gigantism .

Familial tall stature and obesity make up the majority of tall children .

Poor weight gain /failure to thrive (FTT):

Early puberty :

Commoner in girls , often constitutional in nature , defined as development of secondary sexual characteristics in girls before 7 years , and boys before 9 years . growth should be checked to see whether

Developmental assessment by Dr.Asma Hadida

accelerated , and examination carried out to differentiate between true precocious puberty and virilization(false precocious puberty) .

Characteristic	True precocious puberty	Virilization
Secondary sexual characters	Present	Present (hirsutism ++)
Breast development	Present	Absent
Penis and testis	Both enlarge	Penis only
Clitoris	Normal development	Excessive enlargement
Spermatogenesis /ovulation	Present	Absent
Family history	Frequent	Absent

Delayed puberty :

- This is normal constitutional and associated with growth delay familial .
- Defined as no sexual development by the age of 15years of boys and 14years in girls .
- Careful examination for puberty staging is essential in order to avoid mistakes .in boys the testicular and in girls breast bud development are the most useful physical signs .
- It is always wise to check chromosome karyotype to exclude turner syndrome(in female) and klinefelter syndrome in (male) .

