



# PUBERTY

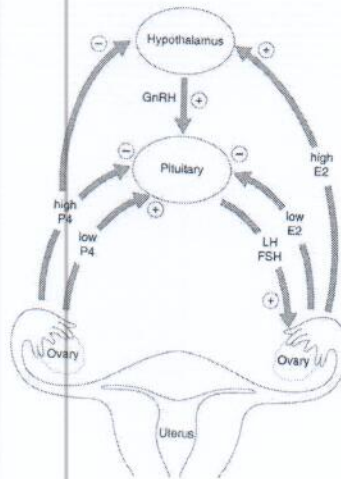
Dr N Muhaidat

## Definition



The process of reproductive and sexual development and maturation that changes a child into an adult

## HPO axis



## HPO axis

The development of the anterior pituitary in the human starts between the fourth and fifth weeks of fetal life, and by the 12th week of gestation the vascular connection between the hypothalamus and the pituitary is functional

## HPO axis

- GnRH is detectable in the hypothalamus by 10 weeks of gestation
- By 10–13 weeks FSH and LH are produced in the pituitary.
- The peak pituitary concentrations of FSH and LH occur at about 20–23 weeks of intrauterine life, and peak circulating levels occur at 28 weeks.

## HPO axis

- Beginning at midgestation, there is an increasing sensitivity to inhibition by steroids and a resultant decrease in gonadotropin secretion
- The rise in gonadotropins after birth reflects loss of the high levels of placental steroids

## HPO axis

- The childhood period is characterized by low levels of gonadotropins in the pituitary and in the blood, little response of the pituitary to GnRH, and maximal hypothalamic suppression
- In girls, the first steroids to rise in the blood are dehydroepiandrosterone (DHEA) and its sulfate (DHEAS) beginning at 6–8 years of age, shortly before FSH begins to increase

## HPO axis

- Pulsatile secretion of gonadotrophins commences at 8-9 years of age
- Ovarian oestrogen initiates the physical changes of puberty

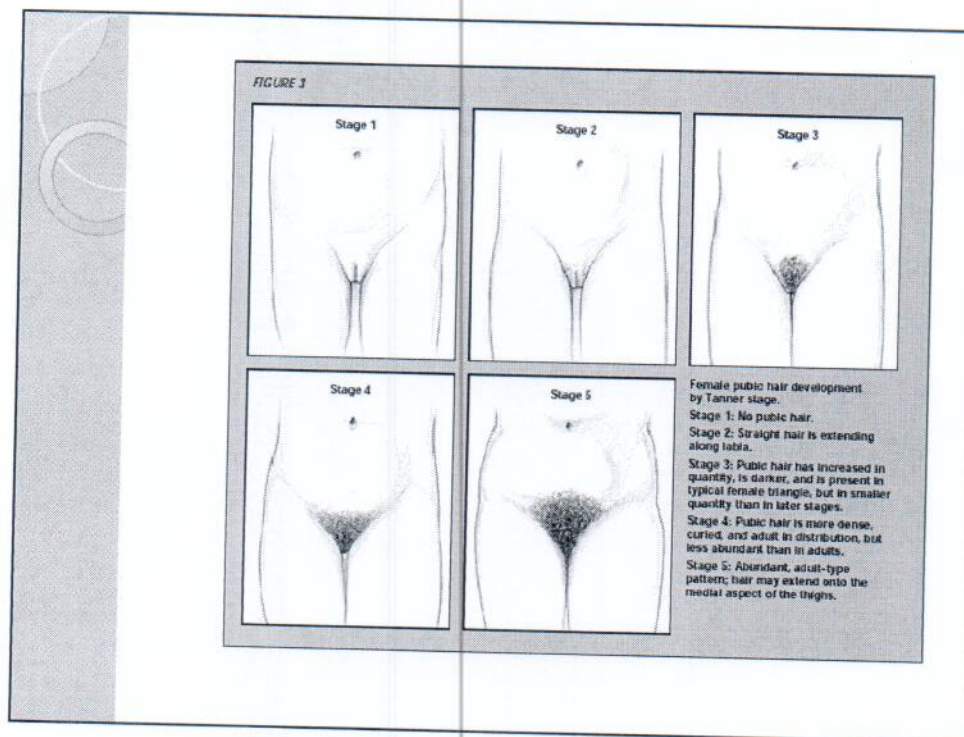
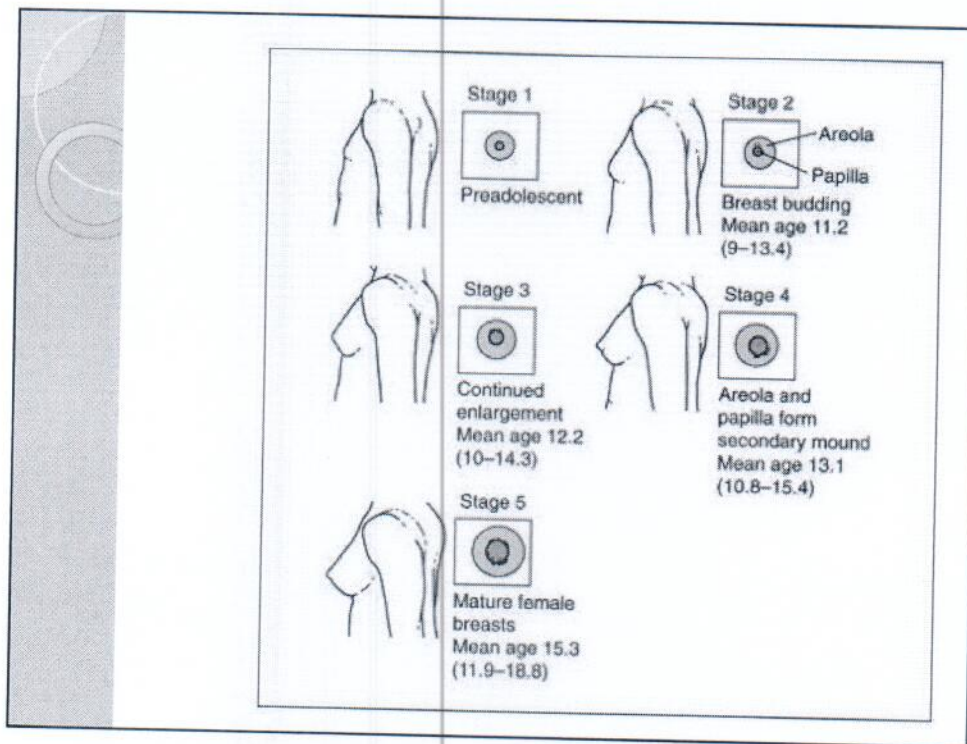


## Physical changes of puberty

- Breast development (thelarche)
- Pubic and axillary hair growth (adrenarche)
- Growth spurt
- Onset of menstruation (menarche)

## Onset of puberty

- Race
- Heredity
- Body weight
- Exercise



## Tanner Staging: Stage 1

### **Prepubertal**

- Height increases at basal rate: 5-6 cm/year
- Breast: Papilla elevation only
- Pubic Hair:
  - Villus hair only
  - No coarse, pigmented hair

## Tanner Staging: Stage 2

- Height increases at accelerated rate: 7-8 cm/year
- Breast:
  - Breast buds palpable and areolae enlarge
- Pubic Hair:
  - Minimal coarse, pigmented hair mainly on labia



### Tanner Staging: Stage 3

- Height increases at peak rate: 8 cm/year (age 12.5)
- Breast:
  - Elevation of Breast contour; areolae enlarge
- Pubic Hair:
  - Dark, coarse, curly hair spreads over mons pubis
- Other changes
  - Axillary hair develops
  - Acne Vulgaris develops

### Tanner Staging: Stage 4

- Height increases at 7 cm/year
- Breast:
  - Areolae forms secondary mound on the Breast
- Pubic Hair:
  - Hair of adult quality
  - No spread to junction of medial thigh with perineum



## Tanner Staging: Stage 5

- No further height increases after age 16 years
- Breast:
  - Adult Breast contour
  - Areola recesses to general contour of Breast
- Pubic hair
  - Adult distribution of hair
  - Pubic hair spreads to medial thigh
  - Pubic hair does not extend up linea alba

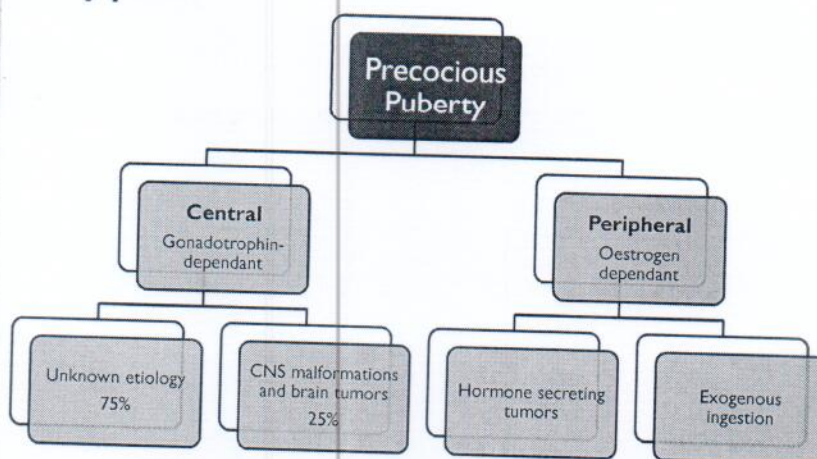
## Menarche

- Mean age 12.8 years
- Initially cycles may be anovulatory, irregular and unpredictable

## Precocious Puberty

- Onset of puberty at an age less than 8y in a girl or 9y in a boy

## Types



## Investigations

- Hormone profile
- Hand and wrist x-ray
- GnRH stimulation test
- Brain imaging
- Pelvic US
- Tumor markers

## Treatment

- GnRH analogue therapy
- Treat the underlying cause

## Delayed puberty

- No signs of secondary sexual characteristics by age 14y

### Types

## Delayed puberty

### Hypogonadotrophic hypogonadism

- Constitutional
- Anorexia nervosa
- Excessive exercise
- Chronic illness
- Pituitary tumors
- Kallman syndrome

### Hypergonadotrophic hypogonadism

- Idiopathic premature ovarian failure
- Autoimmune ovarian failure
- Chemo/radiotherapy
- Turner syndrome
- XX gonadal dysgenesis



## Delayed Puberty

### Investigation:

- FSH, LH
- Karyotyping
- Pelvic US
- X-ray to determine bone age

## Treatment

- Target the underlying cause
- Watchful waiting
- Gonadal hormone replacement
- Growth hormone therapy

21/11/1440

