CHAPTER VI
INTRODUCTION

Growth and development are distinct terms and convey different meaning. "Growth" implies an increase in overall size and shape. The term "development" refers to functional complexity, a state of maturity of an individual i.e. a progress towards adulthood. The developmental complexity, includes all round performances, i.e. psychosomatic, ossification of epiphisis, menarche, dental erruption appearance of secondary sexual characters.

Puberty is a biological phenomenon that includes changes in the body composition and anthropometry, essentially under the influence of hormones and neuro-physiologic control. Whereas, adolescence is physiologic, cognitive and cultural maturation process initiated by the biological changes of puberty. The growth and development are progressive processes in human beings. Growth starts long before the puberty is reached.

In pre-adolescent stage, the anthropometric measurements for boys and girls are almost similar, although the body composition and the reproductive organs differ. But at the adolescent stage, anthropometric measurements and body compositions differ markedly in both sexes. On an average, the female attains adolescence at about 12 years and the male at about 14 years.
The pattern of these developmental changes that occur are in turn modified and individualized by the genetic potential as well as environmental and socio-cultural influences. This pattern of maturation in turn is reflected in the physical and mental health; moral and ethical impregnation and life value appreciation of the adolescent. Thus many different criteria influence the maturation cycle through which a child passes to reach the adult summit. Puberty is that period in the growth and development of the child which encompasses the initiation and progression of sexual and physical maturation (Forfar and Gavin 1978). The changes involved in maturity include both body composition and anthropometry, essentially under the influence of hormones and neuro-physiologic control.

Watson and Lowerey (1967) defined development as a functional maturation. Handler (1973) attributes development to progressive changes that occur during an organism's life history. According to Reddy (1980) the physical developments are mostly marked during adolescence.

Puberty, is the one time in the life of an individual, in which the growth velocity actually increases after having followed a progressively declining course, throughout the early childhood years. This demonstrable increase in growth is evident in both physical and sexual aspects.
Boas (1897) found that children who were tall before puberty began adolescence earlier than those who were short. This finding has been amply confirmed by other workers. Early menarche girls are greater in height and weight at ages 6, 7 and 8 before the influence of spurt can make itself felt. At maturity however there is no difference in height between these two groups. Other data actually show later maturers a trifle taller chiefly due to greater leg length. Weight difference in favour of early maturers however persists, so they have more weight for height than late maturers. This was attributed to the fact that cessation of growth in height resulting from fusion of epiphyses of shafts of long bones in early maturers.

The skeletal maturity and age at which secondary sex characters develop are closely associated. In other words the girls, who are skeletally advanced at the time of adolescence also menstruate early, thus the date of menarche is much more closely related to skeletal maturity than it is to chronological age.

**Menarche:**

The age of menarche has been studied by innumerable workers in the West and also in India as a parameter to illustrate the secular trend of sexual development in girls. Since the attainment of menarche holds the endpoint of reproductive maturity in the female. It is a well defined parameter for evaluation.
Menarche is a unique and easily recognizable important landmark of sexual maturation in a woman's life. Very little is known about the exact mechanism how the biological alarm clock is set to give the starting signal for growth and sexual maturation process in an individual. However, according to Frisch & Revelle (1970) "critical body weight triggering a change in metabolic rate, in turn, reducing the sensitivity of hypothalamus to estrogen thus altering the ovarian hypothalamus feedback." Curtis (1947) stated that menarche is the highest point of an endocrinal development which starts about five years before puberty. Gessel et al. (1956) defined menarche as an important episode or the milestone of woman's life, which is followed by a sequence of manifestations of adolescence. According to Jeffcoate (1957) menarche is the onset of menstruation and is merely one manifestation of puberty.

The differential trend of onset of menarche among different populations indicate the genetic basis of the trait. Kisch (1910) observed that in girls of the Semitic races, menarche occurs earlier than among those of the Aryan races. Jacboy (1953) remarked that age of menarche varied greatly in individuals amongst races and with climate. Reed and Mcleod (1955) commented that as there were familiar and racial differential of onset of puberty, genetic factors probably determined the level of the maturity.
Jeffcoate (1957) was of the opinion that the age of menarche varies to some extent with family, race, social class and environment but not with climate. McArthus (1957) stressed the role of heredity in influencing the menarcheal age.

Heredity is alleged by some workers to be a factor influencing the age of menarche. Wilson and Sutherland (1949) noted that there is a tendency for children whose mothers had early menarche to menstruate earlier than normal.

Lee (1930) studied the onset of menarche among Korean students. His results confirmed the early findings of Noguchi (Japan) and Twang (Formosa). The age of menarche among Mongolian girls ranges from 14 to 16 years. Bolk (1916) studied onset of menarche among Dutch women. A similar work was done by Wojciech Zukowski and Alinaknietowicz (1964) on Polish women. Kennedy (1933) studied 10,000 individuals from Italy and USSR, and failed to find any relationship between climatic condition and the age of menarche.

Age of menarche is determined by a large conglomerate of environmental and genetic factors. A few major factors considered here are:
Ito (1942) showed that in Los Angeles there were significant differences in the age at menarche of American, European, Japanese, Negro and Chinese girls of the same college. However, even this study may not be free from bias due to nutritional or socio-economic conditions. Ellis (1946) had written "heredity" whilst it may affect the age of puberty of the individual, is probably not of major importance, when communities of different ethnic stock living under similar social and environmental conditions are compared. Indian studies have shown that of the various religions and ethnic groups, menarcheal age in Muslims has been higher as compared to Christians and Hindus.

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In the past, climate was thought to be the principal factor affecting the age of menarche showing onset of menarche in Indian girls earlier than their European counter parts. This was attributed to the hot environmental conditions which probably indirectly affect growth and development and influenced menarche. It has been occurring earlier in southern parts than in the northern nations of the world.
It is impossible to discuss nutrition adequately without reference to the socio-economic status of girls because the latter largely determines the former. The evidence for stating that higher socio-economic groups mature earlier, has been detailed by various workers. Lee (1963), Brown (1966), Prabhakar (1972) and Vijaya-Raghavan (1971).

Various studies have shown that children born earlier in larger families attain menarche later than do the younger siblings, which is explained by the fact that there was more homosexual stimulation in the later born girls.

**Secondary Sex Characters**:

In the female child adolescence shows itself in the form of enlargement of breasts, development of pubic and axillary hairs and a very definite landmark menarche. At present, detailed information about the rate at which girls progress through the stages of puberty and about the relation of one event to another is lacking. The only recent European study, in which the events of puberty have been followed longitudinally is the Harpenden growth study which began in 1950 in London and is still in progress. The estimated mean ages at which the various stages of puberty were reached were observed by the following workers. Reynolds (1948), Marshall and Tanner (1969), Bai and Vijayalaxmi (1973), Bhargava et al. (1980).
Breast Growth:

The earliest sign of onset of puberty in girls is development of the breast. Marshall and Tanner (1969) opine that the interval $B_2$ and $B_5$ increases with diminishing nutritional status, and is shorter in well fed children.

The breasts develop almost concurrently with pubic hair growth in girls. The area around the nipple begins to enlarge (budding of the breast) normally between 8 to 13 years, with an average of 11.5 years. On an average, in Indian girls, the time taken from stage 2 development (elevation of breast and papilla as small mound with enlargement of the areolar diameter) to the stage 5 development (projection of areola and papilla and the general contour of the mature breast) is about four and half years. After budding of the breast the ducts and the acini develop within 2-3 years and then fat is deposited to make the breast more prominent and round. In the fully mature stage, further proliferation of glands and more deposition of fat may occur in some girls. The maturity of the breast is attained between 12 to 19 years in 95 percent of female populations, which is dependant on better nutrition and health and synchronised balanced action of the various hormones (Nag 1982). Onset of stage $B_2$ in British girls is 11.6, Tanner (1962). Various Indian studies have shown that mean age of onset of breast development, Indian populations as reported Prabakar et. al. (1972), Bai et. al. (1973) Bhargava et. al. (1980), Qamra (1984), KaUL et. al. (1980).
Pubic Hair Growth:

Progress along the path toward reproductive maturity is assessed by stages of appearance of the secondary sex characteristics breast development and onset of menstruation in girls. Pubic and axillary hair growth in girls.

In 20 per cent girls, the pubic hair growth is the earliest secondary sexual characteristic feature to appear, menarche appears about $1 \frac{1}{2} - 2$ years later (Nag 1982). It has been found out that the period between the appearance of breast bud and the onset of pubic hair is 0.05 (S.D. 1.7) years and from the breast bud growth to adult pubic hair development is 3.1 (S.D. 2.1) years. Nag (1982) observed in girls from Northern India, that pubic hair development occurred simultaneously or had slightly preceded the breast development (Bhatnagar and Malhotra 1976). According to Nag (1982) the pubic hair development starts almost an year later in western girls but attain maturity at the same time as breasts and almost at the same age as Indian girls have.

Axillary Hair Growth:

Axillary hair usually first appears some 2 years after the beginning of pubic hair growth; that is when pubic hair is just reaching stage 4. However, there is enough variability in this relation so that a very few children's axillary hair actually appears first.
Badlani (1988-89) reported that development of axillary hair among tribal and nontribal girls at the age of 12.5 years. Bhatnagar and Malhotra (1976) examined and observed the mean age for appearance of axillary hair at the age of 12.73 years for girls from Delhi area.

The adolescents in India require elaborate study, specially regarding growth, development, endocrine and genetic aspects, nutrition, sex and behavioural characteristics. The study of adolescence encompasses the various disciplines of medical and bio-social science. The biological changes leading to maturation may be affected by other factors. It is evident that adverse economic circumstances which effect nutrition may delay the appearance of puberty. The earlier arrival at puberty can also be delayed because of emotional deprivation and stress. The environmental conditions like changing culture and changing home condition may have some relationship to youth role.
REFERENCES


