Chapter II

REVIEW OF LITERATURE:
SECTION - A

GROWTH
Growth an extremely regular process, refers to the continuous addition in body dimensions of an organism over a period of time (Kaul and Nyamongo 1990). It denotes a net increase in the size or mass of tissues. It is largely attributed to multiplication of cells and increase in the intracellular substance. Hypertrophy or expansion of cell size contributes to a lesser extent to the process of Growth (Ghai 1993). Since growth signifies an increase in the size of the body and its different organs, it can be measured in terms of centimeters or inches and kilograms or pounds (Park and Park 1983).

The growth of a child is the outward expression of the interaction between its genetic potential and environment. The various stages of the growth process, i.e. embryonic, foetal, neonatal, infancy, childhood, and the adolescence merge smoothly with each other to provide, under normal conditions, a smooth continuum from conception to adulthood. Although growth progresses in a smooth and harmonious fashion, it is not uniform across the various stages (Srivastava 1998).

Most people equate growth with an increase in height and weight. These are, of course, the most obvious signs, but there are also less apparent kinds of growth in infants. Increases in weight and height are only a rough index of total growth because different parts of the body mature at different rates (Ambron 1975).
I: The Course of Physical Growth

At an early age and throughout life a child’s image of his body and its properties are important features of the conception of himself. A young child is especially reminded of his body size and his physical strength. Being small has much the same meaning as being older and having more knowledge and self directive (Sharma 1995).

1.1: Changes in Body Size

The most obvious signs of physical growth are changes in the size of the child’s body as a whole. During infancy, these changes are faster than they will be at any time after birth. By the end of the first year, the infant’s height is 50 per cent greater than it was at birth; and by 2 years, it is 75 per cent greater. Weight shows similar dramatic gains. By 5 months, birth weight has doubled; at 1 year, it has tripled; and 2 years, it has quadrupled. Infact, if children kept growing at the rate they do during the early months of life, by age 10 they would be 10 feet tall and weigh 200 pounds. Fortunately, growth slows in early and middle childhood.

Two types of growth curves are used to track changes in height and weight. Distance curve and velocity curve. Distance curve plots the average height and weight of a sample of children at each age. The group averages are referred to as growth norms. Velocity curve plots the average amount of growth at each early interval (Berk 1994).

Since the overall growth trends are derived from group averages, they are deceiving in one respect. Researchers who have carefully tracked height changes of individual children report that rather than steady gains, little growth spurts occur throughout infancy and childhood. In one investigation, infants were followed over the first 21 months of life - They went for period of 7 to 63 days with no growth and then
added as much as a half-inch in a 24 hour period. Almost always, parents described their babies as irritable, restless, and very hungry on the day before the spurt (Lamp, Veldhuis and Johnson, 1992). A study of Scottish children, who were followed between the ages 3 and 10, revealed similar but more widely spaced spurts in height. Girls tended to forge ahead at ages four and a half, six and a half, eight and a half and ten, boys slightly later at four and a half, seven, nine and ten and a half. In between these spurts were lulls in which growth was slower (Butler, Mckie and RatCliff 1990).

I.2: Changes in Body Proportions

As the child’s overall size increases, different parts of body grow at different rates. The head develops first from the primitive embryonic disk, followed by the lower portion of the body. During infancy, the head and chest continue to have a growth advantage, but the trunk and legs gradually pick up speed. Physical growth during infancy and childhood follows proximodistal trend. It begins at the center of the body and moves outwards, with the upper arms growing before the lower arms, which grow before the hands. Although body proportions of girls and boys are similar in infancy and childhood, major difference that are typical of young adults appear during adolescence. These differences are caused by the action of sex hormones on skeletal growths. Boys end up much larger than girls and their legs are longer in relation to the rest of the body. The major reason is that boys benefit from two extra years of preadolescent growth, when the legs are growing the fastest (Tanner 1990).

I.3: Changes in Body Composition

Major changes in the body’s muscle fat make up take place with age. Body fat begins to increase in the last few weeks of prenatal life and continues to do so after birth, reaching a peak at about 9 months of age. This very early rise in “baby fat” helps the small infant to keep constant body temperature. Then, beginning in the second year
of life, children become more slender, a trend that continues into middle childhood. At birth, girls have slightly more body fat than boys, a difference that becomes greater over the course of childhood. Around age 8, girls start to add more fat than boys on their arms, legs and trunk, and they do so throughout puberty. In contrast, the arm and leg fat of adolescent boys decreases (Tanner and Whitehouse 1975).

Muscle grows according to a different pattern than fat, accumulating very slowly throughout infancy and childhood. Then it rises dramatically at adolescence. Although both sexes gain in muscle at puberty. The increase is much greater for boys, who develop larger skeletal muscles and hearts and a great lung capacity. Also, the number of red blood cells, and therefore the ability to carry oxygen from the lungs to the muscles, increases in boys but not in girls (Katchadourian 1977).

1.4: Skeletal Growth

The skeletal system is made up of bones and teeth. Most people think of skeletal in terms of changes in height and weight and the appearance of teeth (Decker 1988). Since children of the same age differ markedly in the rates of growth, researchers have devised methods for measuring progress towards physical maturity. These techniques are useful for studying the causes and consequences of individual differences in physical growth. They also provide rough estimates of children’s chronological age in areas of the world where birth dates are not recorded (Berk 1994).

The best way of estimating a child’s physical maturity is to use skeletal age, a measure of development of the bones of the body. Skeletal age can be estimated by X-raying the bones of the body and seeing how many epiphyses there are and the extent to which they are fused. In the absence of X-rays, dental development is likely to be advanced in physical maturity (Mott; James and Sperhac 1990).
When the skeletal ages of infants and children are examined, girls are considerably ahead of boys. At birth, the difference between the sexes amounts to about 4 to 6 weeks a gap that widens over infancy and childhood and is responsible for the fact that girls reach their full body size several years before boys. Girls are advanced in development of other organs as well. Girls also experience fewer developmental problems, and infant and childhood mortality for girls is also lower (Tanner 1990).

II: Nature and Phenomena of Growth

The individual is ever changing in terms of growth and morphogenesis. The nature and the phenomena of growth are considered here in relation to the eras of major change or difference in growth rate, namely intrauterine life, infancy, childhood, adolescence, and adulthood (Smith 1976).

II.1: Intrauterine Life

The Major Era of Maternal Influences on Growth: The size of a full-term infant does not correlate well with the size of the father; it correlates more with the size of the mother (Morton 1955; Cawley et al 1954). Thomson has emphasized that large mothers have larger babies: The offspring of a 170 cm, 75 kg woman was 0.75 kg larger than the newborn of a 150 cm, 40 kg woman. The practical application of this knowledge has been stressed by Mata. His studies in a Guatemalan rural village demonstrated that smaller women have smaller babies, who have higher rates of morbidity and mortality from infectious disease, remain smaller and do not perform as well as babies born of larger women (Smith 1976). Placenta and sex of the baby has a role to play in the deceleration of late fetal growth. The male fetus grows faster than the female, predominantly after 32 weeks gestation. Thus, the newborn boy averages 9cm longer, is 150 gm heavier, and has a greater head circumference at full term than
the female (Babson, Behrman and Lessel 1970). Male newborn babies are slightly more muscular and less obese than female newborn babies (Tanner 1974).

II.2: Infancy

The Era of Changing Growth Rate: The faster late fetal growth rate of the male as compared to that of the female in length, weight, and head growth continues for three to six months after birth (Smith et al 1976). Thereafter, there is no appreciable sex difference in growth rate until the advent of adolescence.

After birth, the infant shifts from a growth rate that is predominantly determined by maternal factors to one that is increasingly related to his own genetic background, as reflected by mid-parental size. As a consequence, for about two thirds of normal infants, the linear growth rate shifts during the first 12 to 18 months. The number shifting upward and the number shifting downward in growth rate are about equal (Smith, Truong et al 1976). Infants who are relatively small at birth but whose genetic background indicates larger size begin their acceleration towards the new growth rate soon after birth, and they have achieved a new channel of growth by 4 to 18 months (Smith et al 1976).

Thus, new borns who are small for gestational age but have the genetic capacity to catch up to the normal range generally show accelerated growth within the first six months after birth. In contrast, most small-for-date babies who do not show catch-up growth during the first 6 months continue to grow at a slow rate into childhood and are generally destined to be of small structure (Fitzhardine and Steven 1972).

During infancy, the infant is generally obese and by 1 year is more than 50 percent longer than at birth and about three times as heavy. Towards the latter part of the first year, there is a gradual diminution in growth rate, accompanied by a reduction in
the degree of adiposity (Garn et al 1983). By 18 months to 2 years, the older infant has achieved the more consistent growth rate of childhood.

II.3: Childhood

The Era of Stable Growth: By the age of 18 months to 2 years the major shifts in infantile growth rate are over, and the child grows at a fairly consistent rate of 5 to 7.5 cm yearly. There is gradual deceleration of linear growth rate and an acceleration of weight gain in the period between infancy and adolescence. The major period of brain growth is then over, and lymphoid tissue has achieved its greatest size in proportion to the individual. Adiposity is relatively less in mid-childhood but often increases in the few years before adolescence (Smith 1976).

II.4: Adolescence

The Era of Sex Hormone-induced Shifting Growth: The acceleration of linear growth gradually increases, with a peak growth velocity about two to three years after the advent of adolescence. The female matures more rapidly than the male throughout childhood and begins adolescence two years earlier, at the average age of 10 years (Smith 1976).

III: Principles of Physical Growth

III.1: The Principle of Developmental Direction

Growth, both in physical structure and in functioning, tends to proceed along head-to-feet (Cephalocaudal) and centre-to-periphery (Proximodistal) gradients. Thus, the head reaches adult size first, the legs last, and internal organs like the heart reach full capacity to function before the extremities do.
III.2: The Principle of Continuity

Bodily growth proceeds in a continuous fashion. It is not reversible and never stops except when a child is affected with disease or severe malnutrition. However, somatic (bodily) growth does not always proceed at the same rate; it may spurt or slow down for e.g., typically the periods from birth to 2 years and from 11 to 15 years are times of very rapid growth; the years from 3 through 10 and from 16 through 18 show relatively slow growth.

III.3: The Principle of Developmental Sequence

As a general rule, steps of physical growth follow one another in a somewhat uniform and predictable order. That is, almost all children lose certain baby teeth first, certain other last; almost all reach puberty before they attain physical stature.

Not all children operate according to the same time table, but the sequence of events tends to be predictable.

III.4: The Principle of Maturation or Readiness

Most accomplishments of a child require a certain level of skeletal-muscular-neurological development. When this level of development has been reached, we say that a child biologically is “ready” to perform a certain task. Although he may not perform it even when he is ready, he cannot perform it before that time. Thus, a child of 6 months appears to be unable to control his bladder, no matter how he may try. Nor can a child of 6 months learn to walk.

III.5: The Principle of Individual Growth Patterns

Although developmental direction and sequence are roughly the same for all children, individual children differ greatly with respect to their own time schedules. One baby is able to pick up a ball much sooner than another; one child loses his first incisors earlier than another. Furthermore, the old beliefs that a “slow grower” will
catch up by spurting later on and that a given child will grow faster in some respects than in others seem highly questionable. A child who grows fast in one physical feature is likely to grow fast in all features, and he is likely to continue growing fast until his full growth is reached. The converse is true for a slow grower (Nanda 1998).

IV: Factors Influencing Growth

Growth results from the continuous and complex interplay between heredity and environment (Berk 1994). Some of the factors which influence growth are as follows:

IV.1: Heredity

Our genetic heritage is individual as well as species-specific. In addition to being programmed for the basic developmental sequences, each of us also receives genetic instructions for unique growth tendencies. Both size and body shape seem to be heavily influenced by specific inheritance (Bee 1989). The genes we inherit have the biggest say in moulding our basic body - whether we will be tall and thin, short and stocky or just in between (Mittler 1971). Tall parents tend to have tall children; short parents tend to have short children (Garn 1980). The size of the head is more closely related to that of parents than are the size and shape of hands and feet (Ghai 1993).

Growth potential of children of different racial groups is variable (Ghai 1993). Racial differences are largely the consequence of multiple gene differences. It is not surprising that there should be differences in size and in pace of maturation among some racial groups (Smith 1976). The bones of black children harden earlier than those of white children, and their permanent teeth appear sooner. Black children mature earlier than white children, and they tend to be larger (AAP 1973).
Rate or tempo of growth seems to be an inherited pattern as well. Parents who were themselves early developers, as measured by such things as bone ossification or age of menarche, tend to have children who are fast developers too (Garn 1980).

Since identical twins are much more alike in body size than are fraternal twins, we know that heredity is an important factor in growth. However, this resemblance depends on when infant twins are measured. At birth, the differences in lengths and weights of identical twins are actually greater than those of fraternal twins. The reason is that identical twins share the same placenta, and one baby usually manages to get more nourishment. As long as negative environmental factors are not severe, the smaller baby recovers and swings back to her genetically determined path of growth within a few months (Wilson 1976). This tendency is called catch-up growth, and it persists throughout childhood and adolescence.

Genes control growth by influencing the body’s production of and sensitivity to hormones. Sometimes mutations disrupt this process, leading to deviations in physical size. Occasionally, a mutation becomes widespread in a population. Consider the Efe of Zaire, an African people who typically grow to an adult height of less than 5 feet. During early childhood, the growth of Efe children tapers off to a greater extent than that of other pre-scholars because their bodies are less responsive to growth Hormone (GH). By age 5, the average Efe child is shorter than are 97 per cent of 5 year-olds in the United States (Bailey 1990).

When environmental conditions are adequate, height and rate of physical maturity (as measured by skeletal age and timing of menarche) are strongly influenced by heredity. For example, identical twins generally reach menarche with a month or two of each other, whereas fraternal twins differ by about 12 months (Tanner 1990). Body weight is also affected by hereditary make up, since the weights of adopted
children correlate more strongly with those of their biological than adoptive parents (Stunkard et al. 1986). Nevertheless, reaching genetic potential in any aspect of physical growth depends on appropriate environmental support, and good nutrition is essential.

IV.2: Nutrition

Nutrition is important at any time during growth period, but it is especially critical during infancy because of rapid brain and body growth. A young baby’s energy needs are twice as great as those of an adult. This is because 25 per cent of the infant’s total caloric intake is devoted to growth, and extra calories are needed to keep rapidly developing organs of the body functioning properly (Pipes 1989).

Babies do not just need enough food. They need the right kind of food. In early infancy, breast-feeding is especially suited to their needs. Because of the benefits of breast feeding, breast-fed babies in poverty-stricken regions of the world are much less likely to be malnourished and 6 to 14 times more likely to survive the first year of life (Grant 1992).

Breast milk has been termed as the “Ultimate health food” (Olds and Eiger 1973) because it offers so many benefits to babies. Breast-fed children are protected in varying degrees against diarrhea, respiratory infections, allergy, colds, bronchitis, pneumonia, German measles, scarlet fever, and polio (Jelliffe and Jelliffe 1971). They are more likely to have healthy teeth and less likely to be obese or to suffer from premature atherosclerosis (Tank 1960).

However, breast-feeding is not for everyone. Some mothers simply do not like it, or they are embarrassed by it. Occasionally, medical reasons prevent a mother from nursing. If she has a serious viral or bacterial disease, such as AIDS or tuberculosis, she runs the risk of infecting her baby (Seltzer and Benjamin 1990).
By 6 months of age, infants require the nutritional diversity of solid foods and around 1 year, their diets should include all the basic food groups (Mott, James and Sperhac 1990). At about age 2, there is often a dramatic change in the quantity and variety of foods that children will eat. Many who as toddlers tried anything and everything become picky eaters. This decline in appetite is normal. It occurs because growth has slowed. And preschoolers’ wariness of new food may be adaptive. Young children are still learning which items are safe to eat and which are not. By sticking to familiar foods they are less likely to swallow dangerous substances when adults are not around to protect them (Rozin 1990.)

Although the American Association Pediatrics (AAP) recommends waiting to start solid foods until 4 to 6 months of age, many infants begin getting solids-usually cereal or strained fruits by the age of 3-4 months. Some nutritionists condemn early feeding of solids as a form of “forced feeding” (Fomon et al 1979), because babies who cannot sit without support or control their heads and necks cannot effectively communicate when they have had enough.

Of course, children need a good diet beyond infancy. Children who do not get sufficient and proper food due to either poverty or ignorance are malnourished and do not grow properly (Arya 1996). Malnutrition in the early years may have a permanent effect on some parts of the brain and nervous System (Bee 1989).

The period of maximum brain growth is the first 2 to 3 years after birth (particularly the first 6 months after birth). Severe malnutrition during that time, even if the child later has an adequate diet, may still cause a lasting slow rate of physical and motor development (Malina 1982). In developing countries where food resources are limited malnutrition is widespread. Recent evidence indicates that 40 to 60 per cent of the world’s children do not get enough to eat (Lozoff 1989). Among the 4 to 7 per
cent who are severely affected, malnutrition leads to two dietary diseases: Marasmus and Kwashiorker. Kwashiorkor (Protein malnutrition) - this name means the disease-of-the-child-who-is-weaned-when the new child is born. It is very common in those parts of the world where the diet is mainly carbohydrate. Marasmus refers to the severely malnourished child who primarily lacks calories and who is less than 60 percent of the expected weight for age and has no edema (Rendle 1970).

Children who manage to survive these extreme forms of malnutrition grow to be smaller in all body dimensions (Galler, Ramsey and Solimana 1985). In addition, their brains are seriously affected. One long term study at Marasumic children revealed that an improved diet lead to some catch-up growth in height, but the children failed to catch up in head size (Stoch et al 1982).

The effects of milder malnutrition, or subnutrition, are harder to detect and have not been widely studied. We really don’t know how poorly the child must be nourished before we see the effects in growth rate or motor coordination. It does appear, however, that chronic sub-nutrition affects the child’s level of energy, which in turn can affect the nature of the interactions the child has with both the objects and the people around him (Barrett et al 1982). Malnutrition lowers childrens resistance to disease. They are less able to resist viruses, bacteria and fungi then other children (Edelman 1977, Edelman et al, 1973).

IV.3: Illness

Among well-nourished youngsters, ordinary childhood illnesses have no effect on physical growth. But when children are poorly fed, disease interacts with malnutrition in a vicious spiral, and the consequences can be severe.

In developing nations where a large proportion of the population live in poverty, illnesses such as measles and chicken pox occur in infancy and take the form
of severe illnesses. Poor diet depresses the body’s immune system, making children far more susceptible to disease (Eveleth and Tanner 1990). Diseases in turn, is a major cause of malnutrition and, through, it affect growth.

Due to the high prevalence of infections disease. Not only does growth stop, as a rule, during the period of disease, but the sick child gets even less food while ill and convalescing, partly because his appetite is poor and partly as a result of a traditional withholding of certain foods during illness. There is thus a vicious circle; infection aggravates malnutrition and malnutrition renders the child more prone to infection (Wallgrens and Robinson 1973).

IV.4: Emotional Stress

Severe emotional stress is another factor that affects children’s growth. Unloving care or extreme neglect can cause a child to stop growing, even if the child is fed adequately (Stewart and Friedman 1987). Inorganic failure to thrive is usually present by 18 months of age. Infants who have it show all the signs of marasmus. However, no organic (or biological) cause for the baby’s wasted appearance can be found. Enough food is offered, and the infant does not have a serious illness. The behaviour of babies with failure to thrive provides a strong clue to its diagnosis. In addition to apathy and withdrawal, these infants keep their eyes on nearby adults, anxiously watching their every move. They rarely smile when the mother comes near or cuddle when picked up (Leonard et al 1986; Oates 1985). Emotional deprivation as in broken homes or orphanages also interfere with the optimal growth of a child. Anxiety and lack of security and love can affect the hormonal regulation of growth (Arya 1996).
Deprivation dwarfism appears later than failure to thrive, usually between 2 and 15 years. Its most striking features are substantially below average stature, decreased GH secretion and immature skeletal age. Researchers believe that severe emotional deprivation results in stunted growth. When such children are removed from their emotionally inadequate environment their GH levels quickly return to normal and they grow rapidly. But if treatment is delayed until later, the dwarfism can be permanent (Oates et al 1985).

Care giving problems associated with these growth disorders are often grounded in poverty and family disorganization, which place parents under severe stress. However, failure to thrive and deprivation dwarfism do not occur just among the poor. They sometimes appear in economically advantaged families when marital conflict or other pressures cause parents to behave insensitively and destructively towards their children (Gagan 1984).

The study of growth disorders highlights important influences on physical growth that are not readily apparent, when we observe the healthy, normally developing child. In the case of failure to thrive and deprivation dwarfism, we become consciously aware of the close connection between sensitive, loving care and how children grow (Berk 1994).

IV.5: Climate and Altitude

Unless the physical climate, hot or cold, is linked to a difference in nutrition, temperature seems to have little effect on children’s physical growth. Contrary to some popular beliefs, children living in hotter climates do not mature earlier than those living in more temperate zones (Tanner 1970). Altitude appears to slow up growth, but people in mountainous areas also tend to be undernourished. High altitude does induce larger chest circumference and bigger lungs, as proved by a study comparing coastal
and mountain children in Peru (Tanner 1978). Similar adaptations eons ago are probably responsible for the different body types of Africans, Asians, and Caucasians.

**IV.6: Sex Differences**

A particular kind of genetic influence over growth shows up in the differences between males and females. From early on in prenatal development, there are physical differences between boys and girls. Newborn girl's skeletal systems are several weeks more mature than newborn boys. Whatever the inborn differences between them, boys and girls differ in the amounts of experience they have with particular physical activities. These experiences may influence inborn differences -- but not always. Differences in group averages do not tell about the skills of individual girls and individual boys. Even the group differences in abilities between boys and girls tend to be quite small. A study by Milne *et al* (1976) showed that averages for the boys were slightly ahead of those for the girls, in each class there were some girls who could run faster and jump farther than most of the boys in the class.

**IV.7: Endocrine Disorder**

The endocrine disorder in children can be a cause of growth disorder. The children having endocrine disorders appear normal in height and weight at birth. The delay in growth is observed usually after one year. Growth is regular but slow. They gain less than 4cm height per year (Sharma 1995).

Several other factors which affect growth are birth order, parental size, birth weight, socio-economic condition, birth-spacing, single and multiple pregnancies, education of parents.

In the final analysis, the environment seems to produce its effect mainly by the presence (or absence) of infective illness and the plane of nutrition (*Patton et al* 1963). Recent findings also indicate the important role played by psychological factors in
affecting health and consequently growth and even survival (Frank and Zeisal 1988 and WHO 1988). However, of the environmental influences, nutrition has been found to have a greater impact on growth (Jelliffe 1966), and is more critical during the periods of rapid child development. Although growth is influenced by biological and environmental factors at all the stages of development, certain specific changes take place at each stage.

V: Growth Parameters

V.1: Weight

Because it sums up all the increases in body size, weight is an important indicator of growth. Children grow fast during the first two or three years of their lives than they ever will again. A two year old weighs about one-fifth of what he will probably weigh at eighteen (Ambron 1975).

Parents and pediatricians have devised several rules of thumb for calculating what a baby’s average weight gain should be. One formula states that an infant generally doubles his weight during the first five months, triples it by the end of the first year, and quadruples it by two and a half. Another method of calculation says that the average baby gains two pounds per month for the first three months and about one pound per month by the time he is six months old, then tapers off to two-thirds of a pound per month during the second year of life (Ambron 1975). Males double their birth weight sooner than do heavier infants (Pipes 1993).

In the western countries newborns weigh on an average 3.4 kg. Infants weighing under 2.5 kg at birth are classed as premature infants in those countries (Kumar 1988). In different parts of India the average birth weight is about 2,700 to 2,900 gms. Babies born in homes with a higher socio-economic status weigh more than those belonging to poor socio-economic groups. Almost all babies lose weight
during the first three to four days after birth and regain it by seven to ten days. After that, the weight increases by 25 to 30 g a day for the first three months, and thereafter less rapidly (Ghosh 1992).

The child’s rate of weight increases is determined not only by his heredity but also by what and how much he eats. To achieve their growth potential, babies and small children should be given a nutritionally sound diet and be allowed to eat more or less as much they like. Poor nutrition in early childhood can have devastating and long lasting sometimes even permanent effects on all aspects of a child’s development, not just on his weight (Ambron 1975).

Several studies in India have shown that the weight curves of many children are excellent for the first 4 to 5 months of life, with the birth weight doubling by this age. Thereafter, however, the curves tend to flatten, because by this time the breast milk diminishes and insufficient or no food is given to supplement it. Many well-nourished mothers, however, can produce enough breast milk to sustain a baby’s growth for about six months on breast milk alone (Ghosh 1992).

**Growth Velocity**

A.  
- 0-4 months: 1.0 kg/month (30g/day)
- 5-8 months: 0.75 kg/month (20g/day)
- 9-12 months: 0.50 kg/month (10g/day)
- 1-2 years: 3.0 kg/year
- 3-12 years: 2.0 kg/year
- 12-18 years: 5.0-6.0 kg/year (0.5 kg/month)

B.  
- Weight at 4-5 months: 2 x birth weight
- Weight at 1 year: 3 x birth weight
- Weight at 2 years: 4 x birth weight
- Weight at 7 years: 7 x birth weight
- Weight in kg = (Age in years + 3 x 2) (Singh 1996).
V.2: Length or Height

Height like weight increases at a rapid but decelerating rate until adolescence when the adolescent growth spurt occurs. Infants usually increase their lengths by 50% by 1 year of age, double them by 4 years of age, and triple them by 13 years of age (Pipes 1993). You cannot make your child grow taller than he is destined to be, and this depends partly on how tall, his parents are. Adult size is not directly related to size at birth. However, after the first year of life it is possible to predict a child’s adult height from his current height and age, using height and weight charts. This is because most children follow their own particular growth line (Hull 1988).

The average length at birth is about 20 inches. Most babies grow nine or ten inches in their first year and are between thirty-two and their-seven inches tall at the age of two. As with weight, however, the rate of increase is much more important than the number of inches in determining normality. A more significant way of calculating height increases during the first two years of life, therefore, is by percentages. In the first 3 months a child increases his overall length about 20% nearly 50% by one year and almost 75% by age two (Ambron 1975).

Height Velocity

A. At birth 20 inches (50 cm)
   Gain during 1st year 10 inches (25 cm)
   Gain during 2nd year 5 inches (12.5 cm)
   Gain during 3rd year 3-4 inches (7.5-10 cm)
   Gain during 3 - 12 years 2-3 inches/year (5.0-75 cm)
   Adolescence 8 cm/ year girls
               10 cm / year boys.

B. Length or height (inches) = Age in years x 2.5 + 30
C. Prediction of adult height.

   Adult height can be predicted by the following formulae:

   a) Tanner’s Formulae
      Adult height = height at 2 years × 2
      Adult height = height at 3 years × 1.87.
b) Weech’s Formulae

Adult height in inches

Boys = \(0.545 \times H_3 + 0.544 \times A + 14.84\)

Girls = \(0.545 \times H_3 + 0.544 \times A + 10.09\)

Where \(H_3\) is the height of the child at 3 years and
A refers to mean height of parents (Singh 1996)

V.3: Head Circumference

The brain growth is very rapid during infancy and it is unaffected by mild to moderate degrees of under nutrition. The marasmic children are seen to have relatively large head for their body size. During states of under nutrition of varying severity, weight (Subcutaneous fat and muscles), linear growth (height) and brain growth are affected in that order (Singh 1996). The head circumference is likely to be smaller than usual if the growth of the brain has been defective (Illingworth 1996).

Measurement of head circumference is an important parameter to assess the growth of an infant. The circumference of the head in Indian infants at birth is on an average 13.8 inches or 35 cm.

**Head Circumference Growth Velocity**

- Till 3 months: 2 cm/month
- 3 months - 1 year: 2 cm/3 months (1/3 of initial velocity)
- 1-3 years: 1 cm/year (1/12 of initial velocity)
- 3-5 years: 1 cm/year (1/24 of initial velocity)

During, first year three is 12 cm increase in head circumference, while between 1-5 years age, only 5 cm gain occurs in head size. Adult head size is achieved between 5 to 6 years (Singh 1996).

V.4: Chest Circumference

At birth head circumference is larger by upto 3 cm as compared to chest circumference. The head circumference is larger by more than 3 cm as compared to...
chest circumference at birth in pre-term, small-for-date and hydrocephalic infants. The chest circumference equals head circumference around 9 months to 1 year of age but thereafter chest grows more rapidly as compared to the brain. In pre-term babies, chest circumference may exceed head circumference between 6 to 9 months of age. In malnourished children, chest size may be significantly smaller than the head circumference because growth of the brain is less affected by under nutrition. Therefore, there will be considerable delay before chest circumference overtakes head circumference (Singh 1996).

V.5: Mid-Arm Circumference

Normally, the arm circumference increases rapidly from birth to 1 year, from about 11 to 16 cm. Between the first and fifth birthdays, it remains fairly constant at about 16 to 17 cm among well-nourished children and can be used as an age-independent method. During this time, the fat of early infancy is replaced by muscle. A measurement below 80 per cent of normal, i.e., 12.5 cm, indicates severe malnutrition and between 12.5 cm and 13.5 cm indicates moderate malnutrition (Ghosh 1992).

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<th>Arm Circumference for Different Heights</th>
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<td>Mid-arm circumference (cm)</td>
<td>Height (cm)</td>
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<tr>
<td>16.50</td>
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<tr>
<td>12.50</td>
<td>70.00</td>
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</tbody>
</table>

(Singh 1996)
VI: Measurement of Growth

Various Anthropometric measurements helps in monitoring growth of a child. It shows individual is underweight, too thin or in case of a child has not been growing at the normal rate (Davidson et al 1975). Anthropometric measurements are taken daily around the world. They are used to measure growth and nutritionally related disease that effect it, evaluate degrees of malnutrition or to promote child survival monitoring projects. Learning to these measurements accurately requires skill and much practice. Now a training tool has been developed that health care trainees and non professional field workers can use. The tool is not equipment, but a statistical control method that monitors the errors anthropometry students makes and helps to improve their measurement skills (Zerfas 1986). Anthropometry has its own advantages and disadvantages. These are listed below:

Advantages of Anthropometry

- It is reasonably good for evaluating changes in protein energy malnutrition in growing children (Salvey, Nancy and Philip 1981).
- It has been used in surveys primarily to identify growth retardation and obesity both of which may be related to diet.
- It provides an additional check for the reliability of the diet surveys (Lakshmi 1981).
- Anthropometry, particularly the measurements of heights, weight is the single most valuable nutrition assessment tool, particularly in young children but also in certain adult population (Salvey, Nancy and Philip 1981).

Disadvantages of Anthropometry

- The disadvantages of anthropometry as a nutritional assessment tool in developing countries is the lack of information regarding the relationship of anthropometric stature to the prevalence and incidence of morbidity and mortality.
- It is much less successful in detecting modest changes in nutritional status in adults and have little value for evaluating changes in the most micro nutrient levels.
• Certain anthropometric measurements cannot be taken until age is not known (Salvey, Nancy and Philips 1981).

The various anthropometric measurements include measuring.

VI.1: Weight

The weight can be recorded on a beam type weighing scale (Detecto Scale with accuracy of ± 20 g). The scale should be frequently checked with standard weights and zero error must be adjusted before weighing. The bathroom type of scale is very unreliable for children and should not be used. In field conditions Salter spring and Bar scale are quite satisfactory because they are convenient to carry (Singh 1996).

VI.1.1: Salter Weighing Scale

The Salter weighing scale is a reliable, light and portable scale, which can weigh children up to 25 kg. The Salter scale is round in shape, with a needle in the centre. Weights are marked in kilograms around the dial. There are two variations of the Salter scale. One kind has 500 gm markings between kilograms, and the other has 100 gm marking between kilograms. The scale has a screw on top to make the zero adjustment so that the needle points to zero before the child is weighed.

The scale has two hooks. One is on top and is used with a rope to hang the scale on a beam or branch of a tree. The other one is below the dial and is used to hang the sling or pants in which the child is placed for weighing. While weighing the child it is necessary that the child feet should not touch the ground. No one should touch the child while weight is being read. Weight should be taken when the needle stops moving. Weight should be read exactly opposite the scale. It should never be read from the side (NIPCCD 1988).
VI.1.2: Bar Weighing Scale

It is a light metal scale. It is reliable, sensitive and portable and can weigh children up to 20 kgs. It has 2 hooks. Hold the scale so the numbers are right side up. The upper hook is used to hang the scale from a beam or a branch of a tree, and the lower hook is used to hang a basket or sling in which the child is placed for weighing. The Bar scale is graduated from 0-10 kgs. There are two types of Bar scale. In one type of scale, each kilogram is divided into 100 gm divisions. In other type, each kilogram is divided into 50 gm division. Two weights are used with the Bar Scale. The big red weight is always used when weighing children and is attached to the movable slider. The small blue weight is only used for children who weigh more than 10 kgs. It is attached to the fixed bracket on the right side of the scale. At the left end of the scale is a counterweight with a screw in the centre. This is used for balancing the scale if the scale is not horizontal when the basket or sling is on the lower hook, and the slider is at zero. When you are weighing the child see that the scale does not touch a wall or doorway and the scale should be at the workers eye level. Weight should be read to the nearest 100 gms (NIPCCD 1988).

The other types of weighing machines are lever type and nowadays mostly electronic weighing machines are used.

VI.2: Length or Height

Up to 2 years of age, height or rather length is best measured by the infantometer, with the infant lying supine. Assistant is asked to keep the vertex snugly touching the fixed vertical plank. The legs are fully extended by pressing over the knees, and feet are kept vertical at 90 degree, the movable pedal plank of infantometer is snuggly opposed against the soles and length is read from the scale (Singh 1996).
In older children who can stand, height can be measured by the rod attached to the lever-type machine or simply making the child stand against a wall on which a measuring scale is inscribed. The child should stand with bare feet on a flat floor against a wall with feet parallel and with heels, buttocks, shoulders and occiput touching the wall. The head should be held erect with eyes aligned horizontally and ears vertically without tilt. With the help of a wooden spatula or plastic ruler, the topmost point of the vertex is identified on the wall (Singh 1996).

VI.3: Mid-arm Circumference

Mid-arm circumference is measured with a fiberglass or steal tape at the midpoint between acromian and olecranon. The tailors tape is not accurate and should not be used. If the circumference of the arm is less than 12.5 cm, it is suggestive of moderate to severe malnutrition.

Bangle test can be used for quick assessment of arm circumference. A fiberglass ring of internal diameter of 4 cm is slipped up the arm. If it passes above the elbow, it suggests that upper arm is less than 12.5 cm and the child is malnourished (Singh 1996).

Health workers can use tapes with green, yellow and red colors to indicate normal, moderate and severe malnutrition, respectively. This is a useful method for illiterate workers but should be used mainly as a screening procedure for severe malnutrition (Ghosh 1992).

Quac Stick

It is developed on the principle that acute starvation severely affects mid-arm circumference while height is unaffected. The child appears tall, thin and wasted. The Quac Stick is a meter rod with two sets of markings. The expected height of the child against various sizes of mid-arm circumference is inscribed on the rod. The
malnourished child would be taller than the anticipated height derived from the mid-
arm circumference (Singh 1996).

VI.4: Chest Circumference

The chest circumference is measured at the level of the nipples, midway between inspiration and expiration, while the child is in recumbent position. It can be measured with a non-stretchable plastic tape. The reading can be recorded to the nearest 0.1 cm (Ghai 1993).

VI.5: Head Circumference

Growth of the head can be judged by measurement of the circumference, using a non-stretch tape measure going around the head from frontal to occipital region, recording the maximum circumference.

VII: Assessment of Nutritional Status

Growth assessment is an essential component of pediatric health surveillance because almost any problem within the physiologic, interpersonal, and social domains can adversely affect growth (Nelson 1996). The process of normal growth and development is dependent on an adequate and timely supply of nutrients. Undernutrition is reflected in impairment of growth, and therefore an useful indicator of nutritional status. Growth retardation is an important quantifiable manifestation of under nutrition (Gopalan and Chatterjee 1985). As measurement of growth has always been considered a valuable, most convenient and practical tool for the assessment of nutritional status of children, anthropometry has an important place of nutrition surveys of populations.

Nutritional status refers to the state of nurture of an individual or a specific group. The term may refer to a specific nutrient (e.g. Zink) or to a class of nutrients (as in the assessment of PEM) and may apply to either nutritional deficiency or excess
Nutritional status may be assessed in a laboratory, using precise instrumentation or in a field utilising other appropriate methods.

Biological anthropologists have most frequently used field methods in assessing nutritional status. The methods tend to focus either upon the evaluation of dietary intake or upon the measurement of growth and body composition (i.e. nutritional anthropometry). [Kaul and Nyamongo 1990].

Nutritional anthropometry is recognised widely as an effective means of assessing nutritional status. The measurements taken are used to assess either physical growth or body composition (Frisancho 1974). Growth assessed by anthropometric measurements is one of the most sensitive indicators of the nutritional status of child (Devi and Geervani 1998).

Height and weight evaluated against age are most often used to indicate nutritional status. Deviations from the reference value are usually expressed in one of the three ways: (a) as a percentage of the mean; (b) as a Z-score (i.e., a standard score); or (c) as a percentile, according to IUSS-Ashmore and Johnston (1985), the most useful descriptive statistics for the children of developing countries is Z-scores.

Anthropometric measurements have become an indispensable approach for evaluation of nutritional status of children (Frisancho 1984; and Vijayaraghavan 1987). Many measures are currently being used to determine the nutritional status among children (Mishra 1993) Among the most studies are weight, height, arm circumference, skin-fold thickness, chest circumference head circumference (Devi and Geervani 1998 and Mishra 1993). Perhaps the simplest and most commonly used of these measures are height and weight (Expert Committee on Medical Assessment 1996). Some investigators have used the ratio of head circumference to chest
circumference in assessing nutritional status (Jelliffe 1966). However, in a study of Ladino Guatemalan children, (Martorell et al 1975) found this ratio “to have no power to discriminate either populations or individuals who are well nourished or moderately malnourished”.

Height is a measure of growth and poor or inadequate nutrition might be indicated by failure to increase height appropriately (Mishra 1995). Height does not change so rapidly as weight. Therefore, weight can be considered “sensitive” indicator of nutritional status, responsive to acute nutritional deficiency of short duration, while height deficit may be considered to be indicative of chronic nutritional deprivation (Devi and Geervani 1998).

When related for age, weight and height provide the means to study a child over a period of time. Weight for height and arm circumference provides age-independent measure and so is useful when age is difficult to estimate or known. Combinations of these measurements have been suggested, to distinguished “types of a malnutrition (Seoane and Latham 1971). Waterlow et al (1973) has emphasized that weight and height measurements together are useful to understand the dynamics of malnutrition, distinguishing between current and chronic malnutrition. Visweswara Rao et al (1979) has argued persuasively that weight and height measures are adequate for assessing nutritional status and that not much is gained by additional forms of measurement.

Foman (1977) suggested that weight for height or weight for age interpreted in relation to height for age can be useful indicators of excess body weight and if above the 95th percentile, may be used as indicators of obesity.

An investigation by Stine et al (1967) attempted to derive an index of health from body measures. He compared the means of various measures in a coefficient of
correlation and found that height and weight were the most correlated of the measures. Also correlated were height and age and weight and age. He concluded that one measurement alone is not a sufficient index of health.

A weight for height ratio (relative body weight) has been used by some investigators as an age independent index of body-build with the suggestion of a body-mass index of weight/height which attempts to estimate body-mass. The index is highly correlated with weight and relatively independent of height. Jensen (1973) has suggested the use of chest/head circumference ratio as an indicator of nutritional status. However, there is controversy on the use of this index (Mclaren 1972).

Dugdale’s nutritional index (1971) offers the advantages of being relatively easy to measure and is age-independent. This index is based on a power relationship between weight (in kilograms) and height (in centimeters). The index between height and weight are calculated by the equation:

\[
\frac{\text{Weight (kg)}}{\text{Height (cm)}^{1.6}} \times 10^4
\]

Children are classified as malnourished if their nutritional index value is 88 or below (corresponds with third percentile of Stuart-Stevensen Series). A nutritional index of 110 or above would signify obesity (corresponds with ninety seventh percentile in Stuart-Stevenson Series).

VII.1: Weight as an Indicator of Nutritional Status

For an individual child a single weight measurement, in the absence of marked clinical signs, is of limited use. Field workers have noticed that children who by weight for age would be considered moderately or even severely malnourished were “the picture of health itself” with a good deposit of subcutaneous fat.
They were simply small children whose weight at birth had been low, either because they had suffered from intrauterine malnutrition, or because they were born prematurely, or because they were children of small parents (Devi and Geervani 1998).

The size of the child at birth depends mainly on the nutritional status of the mother (Bergner and Susse 1970; and Lechtig et al 1975) her age and number of pregnancies she has had (Selvin and Garfinkel 1972). It is also related to the size of the mother (Gurney and Thompson 1970; Russel 1976). The size of the child at birth seems to determine, to some extent the development of the child during the first few years of life (Tanner and Thompson 1970; Babson 1970 and Cruise 1973).

In some cases, the children may be small because they had previously suffered a period of under nutrition and had failed to catch upon growth. Hence, the importance of differentiating between acute and chronic malnutrition has been stressed repeatedly (Dawn 1964; Seone and Latham 1971; Water low 1973, Water low 1974).

Malnutrition of acute onset is thought to pose more severe threat to life either directly or by rendering the child more susceptible to the effect of various infections. A chronically malnourished child in thought to adopt to the condition (unless it is severe) partly by reducing its need for nutrients through growth failure. More serious than either as an acute exacerbation of chronic condition. (Devi and Geervani 1998).

To differentiate between acute and chronic malnutrition a single weight alone is not enough. An acute episode of malnutrition will reduce the weight of the child, but obviously it will not reduce the height that the child has already achieved; there is therefore a deficit in weight for height.
VIII: Classification of Malnutrition

VIII.1: Seoane and Latham Classification (1971)

This classification takes into account the weight as well as the height of the child. Children are classified into following groups:

- **Normal Children:** with normal height for age, normal weight for age and normal weight for height.
- **Current Acute Short-Duration Malnutrition:** Children with normal height for age, low weight for age and low weight for height.
- **Past Chronic Malnutrition:** This category includes children with low height for age, low weight for age but normal weight for height.
- **Current Long Duration Malnutrition:** It includes children with low height for age, low weight for age and low weight for height.

This classification is shown to be very useful to assess the type and duration of under nutrition.

VIII.2: Water Low Classification

This classification is also based on deficit in weight and height. Water low (1972) has grouped children in following categories:

- **Normal Children:** Children with normal height for age and normal weight for height.
- **Stunted:** Children with low height for age and normal weight for height.
- **Wasted:** Children with normal height for age and low weight for height.
- **Stunted and Wasted Children:** Children with low height for age and low weight for height.

Wasting is considered as current acute under nutrition and stunting without wasting as past chronic under nutrition. Both stunting and wasting is an evidence to
show that the child has both past and current undernutrition. This classification has also received wide recognition and is being used by many scientists.

VIII.3: Following classification has been proposed by Indian Academy of Pediatrics. (As per weight for age).

<table>
<thead>
<tr>
<th>Age</th>
<th>Grade I</th>
<th>Grade II</th>
<th>Grade III</th>
<th>Grade IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>2.4-2.7</td>
<td>2.1-2.3</td>
<td>1.7-2.0</td>
<td>1.6 or less</td>
</tr>
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<td>3 months</td>
<td>4.0-4.5</td>
<td>3.5-3.9</td>
<td>2.9-3.4</td>
<td>2.8 or less</td>
</tr>
<tr>
<td>6 months</td>
<td>5.4-6.1</td>
<td>4.6-5.3</td>
<td>3.9-4.5</td>
<td>3.8 or less</td>
</tr>
<tr>
<td>9 months</td>
<td>6.5-7.3</td>
<td>5.5-6.4</td>
<td>4.6-5.4</td>
<td>4.5 or less</td>
</tr>
<tr>
<td>12 months</td>
<td>7.2-8.1</td>
<td>6.2-7.1</td>
<td>5.1-6.1</td>
<td>5.0 or less</td>
</tr>
<tr>
<td>15 months</td>
<td>7.6-8.6</td>
<td>6.5-7.5</td>
<td>5.4-6.4</td>
<td>5.3 or less</td>
</tr>
<tr>
<td>18 months</td>
<td>8.1-9.1</td>
<td>6.9-8.0</td>
<td>5.8-6.8</td>
<td>5.7 or less</td>
</tr>
<tr>
<td>24 months</td>
<td>9.5-10.7</td>
<td>8.2-9.4</td>
<td>6.8-8.1</td>
<td>6.7 or less</td>
</tr>
</tbody>
</table>

(Singh 1996)

IX: Reference Standards

A child’s growth data is usually compared with that of a ‘reference’ population to facilitate evaluation of his nutritional status. These are usually obtained by measuring a statistically adequate sample of a healthy, well nourished segment of the population with known accurate ages. The observation that well-nourished children in developing countries grow in much the same way as their counterparts in the developed world, has lent support to the use of a single international growth standard for all (Stephenson et al 1983). The underlying assumption is that all children have the same genetic potential especially in the early years of life and their growth is more strongly influenced by environmental factors such as nutrition than by heredity (Habicht et al 1974).

The most frequently used reference standards are derived from studies of growth in healthy children from the US and the UK. The Harvard standards obtained
from Boston children in 1930s have been used extensively throughout the world. Reference data collected on British children (Tanner et al 1966) have been used in development of the “Road-to-health” card.

The National Centre for Health Statistics (NCIHS), USA has collected data on a large, economically and ethnically heterogeneous US child population. The NCIHS reference data are being recommended for use by WHO (Devi and Geevani 1998). Most developing countries lack suitable standards for comparing and monitoring growth of their children. The data collected under the auspices of the Indian Council of Medical Research (ICMR 1972) in different parts of India provide valuable information on heights and weights of children. These are community averages and can be used as reference standards.

The anthropometric data to be used in the development of a reference population should fulfill the following criteria (Waterlow et al 1977):

- Measurement should relate to a well-nourished population;
- The sample should be statistically adequate;
- The sample should be cross-sectional, since the comparisons are of a cross-sectional nature; and,
- Measurements should be carefully made and recorded by observers trained in anthropometric valuables using equipment of well tested design and calibrated at frequent intervals.

Anthropometric data on well-to-do young children from Delhi and Hyderabad have been collected by Ghosh et al (1977) and Rao et al (1976). These studies highlight that given proper environment, particularly good nutrition, the growth potential of Indian children, at least up to adolescence, is comparable to that of children of the west. However, data on well-fed Indian adults is meagre. Rao and Sastry (1977) have reported anthropometric data of young male adults by measuring students attending Indian Institutes of Technology who had attended Public School in their
childhood. The above data obtained on well-to-do children may be used to indicate the optimal growth pattern of Indian children. There is however, a need to collect reference data on the lines of NCHS standards (Hamill et al 1979) to be used as standards of reference.

X: Changing Growth Patterns in the Past 100-200 Years – “The Secular Trend”

During the past 100 to 200 years, there has been a profound change in the pace of maturation and to a lesser extent in the ultimate size of individuals in so-called “developed” countries. This faster maturation has resulted in greater increments of growth and in larger size for age during childhood, and in an earlier advent of adolescence and of final height attainment. Whereas a century ago the average male did not reach final height until 23 years, he now reaches it by 17 years. The age of menarche in the female has dropped from approximately 17 years to approximately 13 years. Thus today maturation occurs about 25 per cent faster. Whether this acceleration of general body maturation is accompanied by acceleration in brain development and in level of performance during childhood is an interesting question. Studies in Scotland have shown a rising intelligence quotient in 11 years old (Boyne 1960).

This accelerated maturation has also given rise to a profound difference in stature during childhood and adolescence. For example, the average 14 year old boy of today is often at the same maturational level and size as the 18 to 19 year old male of 100 years ago. Since the period of linear growth is shooter, the impact on final height attainment is only modest. Some of the estimate of the increase in stature during the past century have been excessive because they compared the stature of former recruits who had not yet ceased growing to the stature of recent recruits of the same age who had reached their final height. (Smith 1976).

For example, Oppers compared the stature of 19 and 25 year old recruits in Holland in the era of 1819 to 1902 to that recorded in the 1960’s. There was increase of 16 cm in the
height of the 19 year olds, whereas there was only a 6 cm increase in the stature of 25 year old recruits. Thus in the late 1800s, the average recruit grew 10 cm more from 19 to 25 years because he was a relatively slow maturer.

The cause or causes for this dramatic change are not known. The most popular hypothesis is that it is the consequence of a decrease in growth inhibiting factors, such as poor childhood nutrition and chronic childhood disease possibly combined with more genetic outbreeding in recent times. Whatever the causes, the concomitant epidemiological data on populations that have undergone this shift show to date only beneficial correlates such as a falling infant mortality rate, which parallels the increase in stature. Some biologists believe improved nutrition and health are largely responsible for these secular gain. Tobias (1975) reported that secular gains are not so great among low-income children, who have poorer diets and are more likely to suffer from growth stunting illnesses. And in countries with widespread poverty and diseases a secular decrease in body size has occurred.

There are now some indications that the trend is leveling off. For example, Wieringten observed no increase in the size of the offspring of well-to-do, large parents, and the Metropolitan Life Insurance Company’s statistics also show no significant increase in stature in the United States from 1954 to 1970.

Humans cannot keep growing larger and maturing earlier indefinitely, since we cannot exceed the genetic limitations of our species. Secular gains have slowed or stopped entirely in some developed countries such as England, Sweden, Norway, Japan and the United States (Chin Rona and Price 1989; Roche 1979). Consequently modern children raised under good nutritional and social conditions are likely to resemble their parents in physical growth more than at any time during the previous 130 years.
SECTION - B
GROWTH STUDIES
I. Growth Studies

I.1: Normal values, and standards

Rao et al (1959) found that retardation in growth was obvious when compared to the percentiles in U.S.A. The lowest percentiles of U.S.A. were considerably higher than the average curves obtained in the present study. The degree of retardation in growth of the Indian infants was, however, not so great in the early periods of infancy. As a rule in all the area surveyed, boys were found to be slightly taller and heavier than girls of the same age.

Udani (1963) compared the weight of children in different socio-economic groups with the children in USA. The study concluded that the physical growth of upper class children compared well with that of American children of various groups in USA percentile standard.

The evaluation of growth and developmental of 1000 children in six urban slums of Kanpur was done in the age group of 0-15 years by Gupta et al (1985). The growth standard was found to be lower than the standard laid down by ICMR. A high incidence of different grades of protein energy mal-nutrition (71%) was recorded. These findings are in agreement with those of other workers. Factors responsible for lower standard of health status were also discussed.

Prasad et al (1994) found that mean birth weight was less than that of average birth weight of American and European infants, However it was comparable to studies conducted by ICMR. The difference in mean birth weight of males and females was found to be statistically significant.
Mathur *et al.* (1994) have reported that average weight of both boys and girls was almost equivalent to the 25th percentile of NCISH standards up to 30 months but fell below these standards thereafter. The average length in both boys and girls was between 25th and 50th percentile of NCISH data. The average weight, length, head and chest circumference in both boys and girls were comparable to ICMR standards. The observations indicates that exclusive breast feeding should be promoted for adequate growth of infants during first six months of life.

A study was conducted by National Nutrition Monitoring bureau (NNMB), Hyderabad to evaluate a possible bias in Indian well to do standard weight values. It was reported that among pre-school age children, girls often fared better compared to boys with regard to body weight. Analysis suggested that there exists a bias and the values quoted for girls in Hyderabad well to-do standard are certainly on the lower side. Hence, as recommended by WHO there is a need to adopt NCHS standard values in assessment of the nutritional status of pre-school children instead of local standards.

Forman *et al.* (1995) reported that after 10 years of urban settlement 680 Bedouin Arab children, who had anthropometric assessment from birth (1981-82) through early childhood, were reassessed in 1991-92 to compare the rates of stunting in early and later childhood as well as to describe the factors influencing current height-for-age. Based on multiple linear regression analysis height in early childhood and maternal height were statistically significantly and positively associated with current mean height-for-age in both cohorts. In the 1982 cohort socio-economic status in early childhood was positively and current family size was negatively and significantly associated with current mean height-for-age. Thus, conditions that were present in early childhood had the largest influence on current height. In 1992, 10% and 6% of the infant siblings of the 1981 and 1982 cohorts, respectively were stunted.
compared with 17% and 1% of the siblings aged 1-2 years of the respective cohorts. Therefore, the high rates of early childhood stunting in 1981-1982 appeared to be a birth cohort specific phenomenon.

Pratiba et al (1985) conducted study on 139 healthy full-term single infants for daily growth. No statistically significant sex related difference was found in the absolute measurements. On an average infants lost weight over first 3.0 days amounting to about 3.9% of the birth weight. This was followed by a positive weight growth and the weight equaled the birth weight by 5.3 days. A significant number of normal infants showed an initial actual reduction in the head size. Multiple stepwise regression analysis showed a significant positive influence of breast feeding on first weeks weight gain, accounting for about 6.5% variation.

Datta Banik (1982) conducted a semi-longitudinal study to find the height and weight of two groups of children between birth to 14 years of age. The results indicate that with better socio-economic status, it is possible to have the growth potential similar to those of Americans. The mean of height and weight of children of both sexes belonging to low income group correspond with 25th percentile and 10th percentile of American standards respectively. The literature available suggests that retardation of growth of children belonging to lower socio-economic groups is due to environmental factors inclusive of nutrition.

Datta Banik et al (1967) in their study on birth weight of Indian infants and its relationship to sex, period of Gestation, Maternal age, parity and socio-economic class found that mean birth weight of male infants was higher than that of the females. There was a tendency for the birth weight to increase with parity upto 3rd order in males and upto 4th order in females. The study further showed that mean birth weight increased with socio-economic classes.
Datta Banik et al (1970) found that Boys were heavier than females at all ages. The birth weight doubled at 4th months, tripled by one and a half years and quadrupled by 3 years. By the end of one and a half years the infant had increased his birth length by 50% and about doubled at one and a half years of age.

Children from relatively higher socio-economic status were heavier and taller from birth up to 5 years. Adverse socio-economic status had more effect on weight than on height.

Shinde et al (1980) conducted a study to examine the growth and development of pre-school children between one to six years of age. The mean weights of children in the study at the age of 1 year compared well with Harvard figures, but beyond this age the mean weight in both the sexes were uniformly low. Comparison of selected weight percentiles also showed that children in the present study compared well with Harvard children at 1 year of age. Beyond this age Harvard children exceeded their Indian counterparts, so that around the age of 3 years the 10th Harvard percentile coincided with the 50th percentile of the study. The mean heights of children compared well with Harvard series up to age 2 years, beyond which mean values were persistently low.

Birth weight seems to influence the subsequent growth and development of the child up to 5 or 6 years. The effect of low birth weight on later growth and development has been studied by a number of researchers in India (Ghai 1980; lyer 1987). These studies showed that the mean growth velocity of such infants was fairly close to that of normal infants.

Agarwal and Agarwal (1994) in their study on physical growth of Indian affluent children have reported that data showed values lower than European and NCHS (American) standards. Centre wise comparison showed that Ludhiana children
approached the latter. The differences in growth seem to be possibly due to lower velocity in Indian children of present study in the first 18 months as compared to American Children.

A cross sectional anthropometric study of children age 0-84 months was performed by Bangenholm et al (1988). A high overall prevalence of wasting and stunting was found among the children. However, rural children exhibited a satisfactory weight-for-height during the first 6 months of life compared with both the references of the urban and slum children. Slum children had a high prevalence of wasting during the first 18 months of life. For the younger age groups, rural children were shorter than urban children but at 7 years of age all the children were similar, with a mean height-for-age corresponding to -1.7 standard deviations of that for the reference population.

Malet et al (1984) conducted a retrospective study of infants mortality from death registers in St Lucia and St Vincent. In both islands post neonatal deaths by month were found to be evenly distributed throughout the first year although the total infant mortality rates differed widely. The growth of a cohort of children from three St Lucian villages was studied. Their weight curve showed faltering at 3 months. Therefore it is concluded that there is no necessary association between this pattern of infant growth and infant mortality rate, nor between the distribution of weight velocity and the distribution of deaths in first year.

Connor’s et al (1999) found that low weight percentile at age 2 years was related to adverse developmental outcome in ELBW infants at high perinatal risk or with neurological impairment though minimal association was present for neurologically normal infants at low perinatal risk.
Bortolus et al (1988) in their study to assess the relationship between birth weight of the child's development at 18th months of age found that children with height and weight less than 10th percentile at 18 months were significantly more frequent in the low birth weight group. Motor problems were about 6 times more common in children with birth weight less than 2500g than in those with birth weight \( \geq 2500g \). This study confirms the differences in growth and development for children in low and normal birth weight.

Kalra et al (1983) conducted a longitudinal study of the growth and development parameters of low birth weight babies. Observations of developmental milestones revealed that SFD infants had advantage over pre term infants so far as attainment of motor milestones are concerned. Both the groups were, however, generally retarded as compared to the control in attaining all the milestones. Higher birth weight infants had advantage over very low birth infants throughout the first one year of life. As regarding Growth the LBW babies when compared to normal weight infants retained the handicaps of weight, length, head and chest circumference with which they were born and remained smaller throughout the first year of life. SFD babies maintained their advantage of growth parameters except in weight throughout the one year period as compared to pre term infants.

Kennedy et al (1999) found that significant catch up growth occurred as length increased from 0.87 at 4 months of age to 0.45 at 18 months. A regression model predicting head circumference at age 18th months was developed that included nutrition and growth variables such as head circumference at 9th months, type of parenteral amino acids administered in the hospital, score weight at 4 months, adjusted age and the time of 1st enteral feeding.
NIN (1983) conducted a study to determine the effect on growth of rural infants during the first year. The data from the study suggests that low birth weight infants catch up with those who were born with a higher birth weight.

1.2: Feeding

Reports examining data on growth in relation to exclusive breast feeding show differing results for e.g. Ahn et al (1980) observed satisfactory growth without supplementation during major part of the first year of life. On the contrary Sidhu et al (1981) and Kumari et al (1981) have reported that adequate growth occurs only for 7 and 3 months respectively among Indian communities. They recommended that in breast fed children weaning should not be delayed beyond 7th month.

Several studies have indicated clearly that breast fed children are less likely to be malnourished and have better weight and height, less chances of infection than bottle fed children (Whiten et al 1969; Rafiqual 1984 and Victora et al 1986).

Numerous studies also indicated that infants wholly or partly breast fed had a much lower incidence of morbidity and mortality than, those given animal milk. It is also clear from several studies that the protective effect of breast feeding declines with age (Clavano 1982).

Conveney (1985) expressing his view whether Breast Milk is the best food for all infants, said that not all infants will benefit from being breast fed. Human milk may be unsuitable for infants with some metabolic conditions, or those whose mothers are undergoing certain drug therapies. The composition of breast milk is influenced by the maternal diet and environmental pollution. Occasional reports of nutritional deficiencies in breast fed infants emphasis the unpredictability of human milk. These reports although rare, serve as reminders that human milk is neither a perfect nor a
complete food. Health workers need to be made aware of the shortcomings of breast milk as well as its undoubted benefits.

Intake and growth were compared between matched cohorts of infants either breast-fed (BF) or formula fed (FF) by Heining et al (1993). Differences in energy and protein intakes were significant at 3, 6, and 9 months. Gains in weight and lean body mass were lower in BF than in FF infants from 3 to 9 months. BF infants gained more weight and lean body mass per gram protein intake but not per mega joule intake. Although growth differences between groups were related to differences in intake, there is no evidence of any functional advantage to the more rapid growth of FF infants.

Grummer and Laurence (1993) reported that several studies that found a relationship between prolonged breast feeding and malnutrition are reviewed. Many studies have shown a negative association between prolonged breast-feeding and growth, but there is little reason to expect the association to be casual.

Bohler et al (1995) conducted a prospective study of 113 children in rural Bhutan, morbidity, nutritional status and feeding practices were recorded monthly over a period of 32 months. This information was related to seasonal variations in rainfall. Diarrhoea had a negative impact on growth, as measured in monthly intervals, during the second and third years of life, reducing daily weight gain by 4.4 + 2.0 g. This impact was largest during the monsoon period. For respiratory tract infections the value was 2.6 + 1.7g. Growth in weight was lowest during the monsoon period. Continued breast feeding was associated with an odds ratio for diarrhoea of 0.51, and for respiratory tract infections of 0.63. Growth in weight was less reduced during the monsoon season for children who were breast fed than for those not breast fed. It was
concluded that breast feeding is of particular importance throughout the warm and rainy season.

Prentice (1994) examined children living in an economically disadvantaged rural area of Hubei province to determine the relationship between duration of breast feeding and growth. It was concluded that mothers in developing countries should be encouraged to breast-feed their children for the first two years of life.

Niels et al (1998) found no significant difference between breast fed and formula-fed infants with respect to weight, length and head circumference. However, when girls were analyzed separately, BF girls differed in growth status and body composition at 4 and 8 months of age, as a result of lower weight gain between 2 and 4 months of age. At 2 - 4 months of age, FF girls had higher weight gains. Although this effect was small and the physiological significance may be questionable.

Karkal (1968) carried out a study on feeding patterns in Bombay. It was found that high proportion of mothers stated breast feeding on third day of their deliveries. The infants were completely dependent on mothers milk for an average of 17-19 weeks. Over 1/4th of mothers started weaning (breast milk supplemented with outside food-either liquids or solid) within a month, half by 3 months and three-fourth by 9 months. By a year, only a few mothers had not begun weaning. Milk was the main supplementary food introduced (98% cases). The analysis showed that the sex of the baby did not make difference as to when the mothers started supplementing breast milk.

Devdas et al (1973) conducted study to locate the nutrient gaps in the diets of 50 children below 30 months of age. It was found that out of 45 children within 12 months of age, 32 were breast-fed fully up to 8th months, after which period they were partly bottle-fed and partly breast fed. The heights and weights of the children were
comparable to ICMR up to 1 year of age. Thereafter, the heights and weights were below ICMR standards. The growth retardation around 12-24 months is reflected in the undulating body weights and other anthropometric values. The head and chest circumference were similar for the target children to those reported by the ICMR.

NIN (1983) conducted a study to find the growth of breast fed infants in the slum population. The study indicates that till 5th month growth of breast fed infant is satisfactory and parallel to that of Harvard infants. After 5th month, faltering in weight starts. The study also indicates that to prevent the faltering of growth after 5 months, supplementation should be introduced between 4-6 months, simultaneously encouraging breast feeding as long as possible.

Khan (1984) conducted a study on 223 children in rural area of Bangladesh. Anthropometric measurements were obtained every month up to 12 months and then every 3 months. The history of feeding was recorded. The mothers were visited weekly to record information on diarrhoeal illness. The average weight of exclusively breast fed children was not significantly different from that of those who were breast fed with supplements. The average weight paralleled the Harvard standard up to the 4th month, and the increase in height showed the same pattern. During the first year the incidences and duration of diarrhoeal attacks were higher in the exclusively breast fed children than in the supplemented groups. On average there was 3.2 attacks of diarrhoea per child per year and the average duration was 15.9 days per child per year during the first 2 years.

NIN (1984-85) conducted a study to see the Growth and development of breast fed infants in urban slums. The results suggest that the breast milk is satisfactory for 70% of the infants only up to 3 months of age. After 4th month, the percentage of infants having poor growth velocity increased significantly indicating that if the
supplements are not introduced at the appropriate time, a high percentage may suffer from moderate to severe malnutrition by 7th or 8th months itself.

Mathur et al (1994) has reported that breast feeding should be promoted for adequate growth of infants during first six months of life.

Kumar et al (1999) observe that exclusively breast fed pre term babies regained birth weight at 2 weeks and then gained 338 g in next two weeks which is near intrauterine growth rate. The mean weight of group I, ie EBF group was significantly higher from 2nd month onward till the of follow up period. Group I babies also had greater head and chest circumferences than group II babies. It is postulated that babies around 33-34 weeks of gestational age can be well managed on exclusive breast feeds but the same may not be true for extremely pre term babies. It was further observed that sickness episodes were significantly lower in EBF pre term babies. Diarrhea, URI, Pneumonia and hospitalization all were lower in EBF group.

1.3: Weaning

Several investigators have reported that introduction of supplementary food before the age of 4 months does not have any significant benefit (Venkatachalam et al 1976). In a study of WHO on breast feeding, it was observed that weight gain was usually low in infants who did not receive any food supplements until after 6 months (WHO and UNICEF, 1989).

The general slowing in the rate of growth among the children investigated after the age 6 months was attributed to lack of early supplementation with protein and calorie rich food (Swaminathan et al 1964; Maya and Rao 1983; Rafiqual 1984) use of cows milk as supplementary food was associated with good nutritional status.
Dusseldorp et al (1996) conducted a longitudinal study to see the relationship between diet and growth in a Dutch population consuming a macrobiotic diet. Anthropometric measurement were taken in 1985, 1987 and in 1993. Analysis indicated significant catch-up in height and arm circumference. In 1993, both girls and boys were still significantly below the reference for height and sum of 4 skin folds for age, and girls were below reference for weight-for-height and arm circumference for age. In girls multiple regression analysis showed a significant positive effect of the consumption frequency of dairy products on catch-up growth in height, weight and arm circumference, after adjustment for menarche age and baseline height, weight and arm circumference. The addition of moderate amounts of dairy products, to a vegetarian type of diet improved growth of children especially girls.

Pollitt et al (1997) conducted a study to determine whether short term supplementary feeding during infancy and childhood have long lasting effects. In 1986, children age 6-60 months participated in a 3 month randomized trial to test the effects of dietary supplement. Again these children were enrolled in 1994. The subjects who had received the supplement before the age of 18 months performed better than control group on the Sternberg test of working memory. It was concluded that the supplementation during infancy was responsible for the difference. This findings shows that supplementation can have long-lasting effects on a specific domain if the child receives it at the appropriate age of development.

Grewal et al (1973) in their study in Madhya Pradesh, India also found that the age at which supplementary foods are introduced into the diet was consistently related to nutritional status. According to them top milk, semisolids and adult diet are started about 3-6 months later in the families of moderate/severely malnourished children, compared to families of normal children.
In rural Bangladesh, a community based weaning intervention used volunteers to teach complementary feeding to families of 62 breast-fed infants aged 6-12 months. Over 5 months, treatment children gained an average 0.46 SD more in weight-for-age than the 55 control subjects and were 0.5 kg heavier at the final measure. The differences were statistically significant (D<0.001). The findings suggest that educational interventions teaching families to feed hygienic, simple, cheap, energy-enriched complementary foods to breast fed infants after 5-6 months can improve child growth, even under impoverished conditions (Brown et al 1992).

1.4: Feeding and Weaning

To determine whether growth faltering during early infancy was attributable to inadequate intake of human milk, the nutrient intakes, 30 Otomi infants were studied at 4 or 6 months of age by Butte et al (1992). The observations revealed that growth velocities were not significantly correlated with nutrient intakes. Growth faltering among Otomi infants despite energy intakes comparable to those of breast-fed infants in more protected environments may have resulted from an increase in the need for nutrients or from a growth-limiting nutrient, other than energy in their diet.

A study was conducted by Cohen et al (1994) to evaluate whether there are any advantages of complementary feeding of breast-fed infants prior to six months. Low income primiparous mothers who had exclusively breast fed for 4 months were studied in Honduras, and results indicate that breast fed infants self-regulate their total energy intake when other foods are introduced.

Handerson et al (1994) have reported that the current references on infants growth and development by the WHO are inadequate and have caused alarm among health care professionals when infants fall below the range. The introduction of supplementary foods in breast-fed children can be life-threatening, especially in
developing countries where water and food sanitation is poor and can cause fatal infections.

Marquis et al (1977) conducted a study on 107 breast fed and weaned children to determine whether breast milk contributed to improved linear growth between 12 and 15 months of age. The results revealed that complementary foods, animal-product foods, and breast milk all promoted toddlers linear growth. In subjects with low intakes of animal product foods, breast-feeding was positively associated with linear growth. Linear growth was also positively associated with intake of animal-product foods in children with low intakes of complementary foods. When the family's diet is low in quality, breast milk is an especially important source of energy, protein and accompanying micro nutrients in young children. Thus, continued breast-feeding after 1 year of age, in conjunction with feeding of complementary foods, should be encouraged in toddlers living in poor circumstances.

Dewey et al (1999) conducted a study on Age of introduction of complementary foods and growth of term Low-Birth-Weight, breast fed infants. It was concluded that there was no growth advantage of complementary feeding of small-for-gestational- age, breast fed infants between 4 and 6 months of age.

Child feeding practice and the dietary pattern upto 3 years of age in relation to economic background and maternal literacy has been studied by Nalwa (1981). The type of pre lacteal feed used and the time lag in initiating breast feeding varied among the different economic and educational strata, the association being more significant with income. However, mean ages of introduction of Top feeds, semi-solids, solids as well as completion of weaning were associated more significantly with education. The dietary pattern, in general, was far from satisfactory in all categories and more so among the lower strata.
NIN (1981) conducted a study to identify the appropriate age for introduction of supplements for infants. The results indicate that growth status of solely breast fed infants was more or less same as that of Harvard infants up to the age of about 5-6 months, but was impaired thereafter. Increments of height and weight were reduced and prevalence of various forms of malnutrition increased beyond the age of 6 months. The mean age at which growth rates starting declining was around 5 months with 95% confidence limits of 4.0-5.75 months. The study concluded that it is desirable to provide supplements to the breast fed infants between the ages of 4 and 6 months to prevent growth faltering.

Sinha and Kumar (1991) report that there was unsatisfactory growth performance of even those who received other foods along with breast milk which is indicative of the fact that the quality and quantity of supplementary foods (along with other factors) were not sufficient to promote normal growth.

Rao and Raj Pathak (1992) conducted a study on breast feeding and weaning practices in relation to nutritional status of Infants. The results revealed that almost all artificially fed infants in lower socio-economic class were malnourished while this was not so in the higher socio-economic class. However, the proportion of malnourished children in the lower socio-economic for partially breast fed (BF+AF) group was comparable with exclusively breast fed (BF) group and was significantly lower (P < 0.01) than Artificial Fed group indicating protective effect of partial breast feeding against risks of contamination associated with weaning foods in such communities. The real bottleneck thus appears to be the lack of knowledge of handling and giving weaning foods in adequate quantities.
Phatak (1993) has reported that the breast fed babies were observed to be leaner by the currently accepted ‘Standards’ which have been established mostly on formula fed babies. The growth pattern of the breast fed babies cannot be interpreted as ‘faltering’ since their motor-mental development was normal and they were thriving well.

Bavdekar et al (1994) conducted a study on infant feeding practices in Bombay slums. Results reveal that 96% infants below the age of 4 months received breast milk, though exclusive breastfeeding was practised only in 37% infants. Timely complementary feeding rate was only 0.48. 23% of mothers used bottle for administration of supplementary food or water. Only 15.7% of mothers used commercial milk formula and 8.5% used commercial weaning foods.

1.5: Factors Affecting Growth

1.5.1: Socio-Economic Status

The results of the study by Taylor et al (1978) in 6 villages near Manila revealed no association between socio-economic status of family and growth of children, under certain social conditions. Despite large differences in income, there was no significant relationship between total income and nutritional status of children. They considered maternal care and feeding habits to be independent of socio-economic status.

A study was conducted by Ashworth et al (1997) to monitor growth, morbidity and feeding patterns of low birth weight infants from poor families and to investigate the relative contributions of a number of socio-economic maternal and infant variables to post natal growth. It was concluded that the early differential growth patterns are set in utero and are indirectly affected by socio-economic status.
Surya Prakash et al (1973) carried a study on nutritional status of rural children. The results showed mean weight and height of these children among low socio-economic status were equivalent to 5th percentile of the data obtained from children belonging to higher socio-economic group.

Theophilus and Usha (1985) conducted a study to find the growth pattern of healthy infants belonging to low socio-economic group. The results revealed that the healthy infants whose mothers made the best use of facilities in the well baby clinic in particular and the hospital for children in general, showed a fairly satisfactory growth pattern as indicated in all the physical measurements monitored from birth to first year of life, even though the measurements were lower than those reported for normal infants except the crown-heel length. The authors have suggested that intensive nutrition education given to mothers of infant, belonging to low socio-economic group with suitable demonstration geared to local conditions for the feeding and care of infants will help to improve their health and well being in order to give them a better start in life.

Deshmukh et al (1998) conducted a study to find out the prevalence of low birth weight (LBW) and its association with maternal factors. On multivariate analyses the maternal factors significantly associated with LBW were anemia, low socio-economic status, short birth interval, height, maternal age and primiparity. The study concluded that above mentioned factors are significantly risk factors for LBW.

1.5.2: Income

In most of the studies from South East Asia (Gans 1963; Cutting and Cutting 1972; Gupta et al 1973; Devdas 1974; Maya and Rao 1983). Poverty and low economic status was found to be one of the major causes of malnutrition. In these studies a downward trend in the proportion of malnourished children with increasing
socio-economic status was reported. All the variables which measures household wealth or which are considered as proxies for income showed a definite pattern of positive relationship with children’s nutritional status in most of these studies.

Levinson (1974) studied rural Indian children age 6-24 months. He found a low order relationship between income and nutritional status. Cultural practices, diarrhoeal infection, caste, sex and age were found to be major determinants of nutritional status.

Achar and Yankaver (1962) conducted studies on birth weight of South Indian infants. It was found that the average birth weight for the poor and lower middle class was found to be 6.03lbs and 6.5lbs for middle and upper class. An increase in birth weight with parity was found, the effect being more in low income groups. There was direct relationship between the average birth weight and the socio-economic status of the families. The effect of income was most apparent in the case of primipara than women with high parities.

Arora et al (1963) conducted a study to find birth weight of infants in low income groups. The analysis showed that the maximum number of babies had weight less than 4 lbs. The study showed direct relationship between the weight of babies and parity of the mother up to 5th parity. After that the study showed an inverse relationship. It was concluded that the weight of newborns increased with the age of the mother.

However, in few studies, positive relation between income and growth of preschool children was not observed. Swaminathan et al (1964) studied three socio-economic groups of a rural community in India with family income ranging from Rs.100-400 per annum. No relationship was observed between the economic groups and the weight status at birth or at subsequent periods. This was explained by the fact
that the environmental conditions, habits and customs were more or less the same in the entire group of population.

Poverty is defined as a lack of income and resources. It is frequently associated with poor physical growth of children and malnutrition. Several studies indicated that income is the most important factor that determines the nutritional status (Desai et al 1970; Cutting and Cutting 1972, Devdas 1974).

Desai et al (1970) observed growth and income to be associated in their study on pre-school children in Jamaica, in spite of the relatively limited range of socio-economic status in their study area.

Harish Chandra et al (1971) in his study to find the effect of parity on birth weight in the different economic groups showed that at each parity the mean birth weight showed an appropriate fall from the highest income group to the lowest, clearly indicating that the most important single factor that had influenced birth weight was the socio-economic status of the family.

Phodke and Kulkarni (1971) observed that there was no marked difference in the mean birth weight of male and female babies in any of the income group. No differences in birth weights were in any way related to maternal age. However, the economic status of the family was considered as the most important single factor influencing birth weight.

Mushtari (1997) conducted a study on pre-school children to assess the impact of additional income from dairy on somatic status of children. It was concluded that additional income either independently or jointly did not influence height for age, weight for age and weight for height for age of the child.
Bhat and Dahiya (1985) revealed that the relationship of age with height, weight, head and chest circumferences was positive and significant in both sexes. The boys and girls in the high income group were the tallest and the heaviest than those in low and middle income groups. There was a positive and significant correlation between income and height and weight of the subjects.

1.5.3: Literacy of Parents

A mother is the principle provider of the primary care that the child needs during the first 6 years of life. The type of care she provides depends to a large extent on her knowledge and understanding of some aspects of basic nutrition and health care. During the past decade, evidence has accumulated from several studies that maternal education is an important determinant of infant and child mortality (Caldwell 1981; Chen 1986) and also nutritional status of children (Gaise 1969; Bhuiya et al 1986 and Victora et al 1986).

Ailing and Elequin (1976) noted that as the level of education of mother increased, a corresponding decrease in the incidence of 2nd and 3rd degree malnutrition among their pre-school children could be expected.

Study conducted by Christian et al (1988) in Gujarat state of India revealed, that children’s mean daily intake of nutrients increased with the increase in the mother’s educational level. In this study, the difference in the weight and height of children of literate and illiterate mother’s was clear.

Puri et al (1976) in their study found that on an average, solids were introduced at a later age when the mother was illiterate. With an improvement in the educational status of the mother, the solids were added at an earlier age.
Maya and Rao (1983) and later Victoria (1986) found a marked correlation between the prevalence of malnutrition in children and the number of years of schooling of their parents. Stunting and underweight were nearly twice as common among children whose parents had no education than among those whose parents had 1-3 years of schooling.

But in contrast, father’s education appears to have very little effect on nutritional well being of pre-schoolar’s (Grewal et al 1973). Rafiqual (1984) also observed that, given the same amount of education, the mothers education will have a more positive effect than the fathers education on the dietary intake of infants.

1.5.4: Working Status of Mothers

The study conducted by Pachauri et al (1971 a) revealed no trends, between the mothers nature of work and the birth weight. However, definitive trend was observed between the maternal weight of the birth weight and between the per capita income and birth weight.

Pachauri et al (1971 b) found that child’s weight varied positively with mother’s weight and father’s weight. The study found that mother’s weight was relatively more important factor so far as its effect on birth weight was concerned and was followed by the father’s height and weight. It further showed that socio-economic and environmental factors such as malnutrition, overwork, inadequate educational status adversely affected the health and efficiency of mothers. It showed positive correlation of birth weight both with mother’s and father’s occupation.

Evidence from a number of other studies (Grewal et al, 1973) in India, (Rawson and Valverde, (1976) in Costa Rica (Chutikul and Sirilaksana, 1986) in rural Thailand associated women who work outside the home with lower nutritional status for their children. This is often so because the mother’s job seriously affected the
amount of time she is able to devote to child care and young children are often left under the supervision of older siblings.

Rabiee et al (1980) studied the role of maternal work on nutritional status of children in Gilan, Iran. They concluded that maternal work can have a negative effect on child’s nutritional status through non-financial mechanisms that affect food consumption and health.

Mothers working status had significant effect on the height for age of children. Children of mothers who went to work were significantly longer than those who stayed at home (Christian et al 1988). This was attributed to increase in income of families of working mothers in the study at Baroda, India.

1.5.5: Birth Order

Child rank in the family would affect his nutritional status. A higher birth order number implies a large number of children already present in the family. Prevalence of PEM increases with birth ranks, much as it does with family size (Wray and Aguirre, 1969).

1.5.6: Maternal Factors

Relationship between maternal age and birth weight of children has been confirmed in several studies (Raman Kutty et al 1983 and Oni 1986). In a study at Bogota, Christiansen et al, (1975) found the age of mothers to be related to height but not to weight of child. Mothers aged over 30 years had a higher percentage of children of normal height. It has been concluded that maternal age and parity failed to exert any effect on the height and weight of infants.

NIN (1984-85) conducted another study to identify factors influencing the growth velocity of the slum infants. The results revealed that maternal weight gain and
birth weight are closely associated, 60% of low birth weights (<2.5kg) occurred in mothers who gained less than 6 kg. Poor weight gain of infants appears to be related to low weight gain during pregnancy.

Christian et al (1989) found maternal height, months of lactation and weight for height of mother to have significant relationship with weight for age of infants. Mothers height and working status were found to have significant relation with height for age of infants. The author concludes that not a single factor but multiple factors are related to child nutrition which seem to vary under various circumstances of living.

A study was conducted by Fawzi et al (1997) to find the relations between maternal anthropometric status during pregnancy and infant feeding practices and growth from birth through the first 6 months of life. Mean maternal weight at the first prenatal visit at 6 and 9 months of pregnancy were positively associated with birth length and with linear growth between birth and 1,3 and 6 months of age. Maternal height, weight and skin fold thickness at 6 and 9 months of pregnancy were positively associated with mean birth weight. Infants breast-fed exclusively had greater attained weight and weight gain in the first 3 months compared with infants who were bottle-fed exclusively. These findings underscore the need for programs that improve the nutritional status of women before, during, and after pregnancy and encourage exclusive breast-feeding of infants for at least the first 3 months of life.

1.5.7: Other Factors

Several studies have suggested an association between growth failure and the emotional and social environment of the child. Psychosocial factors within the family as a possible cause of growth failure was also revealed by various studies (Coleman and Provence 1957; Talbot 1963).
In most traditional societies, male children are preferred over female children. This is outwardly expressed in terms of the quality of maternal care given and very often manifests in slower growth rates in female children (Taylor et al 1972).

Studies all over the world indicated that malnutrition is commonly seen amongst girls than boys (Grewal 1973; Tripp 1981; Rafiqual 1984).

The findings of Rafiqual (1984) in Bangladesh did not support the hypothesis that male children are favoured over female children in the intra familiar distribution of food. In this study contrary to expectations dietary adequacy ratios were consistently higher for females than males, in the age group of 0-4 years. Bhuiya et al (1986) also reported that there was little difference among male and female in the proportion of malnourished at the lowest socio-economic levels.

In a study by Pande (1965) an association was found between the economic status of family and weight gained by children and the study showed that boys were heavier than girls (5-12 yrs age group), whereas in other studies girls were found to be heavier than boys in the same age.

John and Joseph (1970) in their study conducted on infants born in Bombay hospital found that average birth weight of males was significantly higher than that of female. Parity of the mother of birth weight of child were also found to be positively correlated. It further showed a positive co-relation between the birth weight and the birth order of the child.

Phadke and Limaye (1973) in their study on infant growth in rural and urban Maharashtra has reported that in all age groups boys were taller than girls. Increase in weight, length and head circumference was observed to the maximum during the early months of life and more so during the first month. In general urban infants were found
to be better built than rural infants. In urban groups, the height and weight increased with improvement in the socio-economic status of their family.

The study conducted by Phatak (1975) revealed that there was significant sex and area differences. Boys were found to be superior to girls and urban to rural in most aspects of growth. Growth increased with increase in socio-economic level. Birth order as well as mothers age showed a significant interaction in contributing to weight. Family size was not found to be a significant factor by itself, but had a significant interaction with the mothers age. The mixed longitudinal approach to the sample of 600 children showed almost the same trend of growth as the cross-sectional study.

Physical parameters including birth weight, crown-heal length, crown-rump length, head circumference and chest circumference were studied by Chopdar and Nabarro (1981) in villages of Western Orissa. It was found that the birth weight and all other measurements were greater in males than females. P value for all measurements was less than 0.001.

Longitudinal study on 300 infants in rural areas of St. Vincent by Antrobus (1971) revealed that those children, who lived in houses where there were a total of less than 2 children under 5 years of age were consistently heavier upto 2 years of age than those who belonged to homes with more than 2 under-fives.

Christiansen et al (1975) in their study on poor pre-school children at Bogota, has concluded that smaller families had a higher percentage of children with normal weight and height. In their study the percent children with normal weight and height dropped considerably, in families with 6 or more children.

However, Grewal et al (1973) in their study at M.P, India reported that family size and birth order showed no association with malnutrition.
Most of the studies on determinants of nutritional status have considered family size and type. With social change, more number of nuclear families have emerged which has affected the life style of families both in rural and urban sector. Grewal et al (1973) study in Madhya Pradesh on pre-school children revealed that a large percentage of poorly nourished children belonged to nuclear families. However Victor et al (1986) found no association between nutritional status and type of family (nuclear or extended) in Brazil.

Raman Kutty et al (1979) revealed that the influence of a comparatively large family size (average 6-7) is one of the probable factors affecting height and weight since height and weight of children have been shown to be inversely associated with family size.


Study of Christiansen et al (1975) in Bogota, Colombia indicated that physical growth was positively associated with expenditure on food, sanitary conditions in the home, mothers age, birth interval between the survived children, level of parental newspaper reading, aspirations for children and socio-economic status. Physical growth was negatively associated with crowded living conditions and family size. Mothers age, family size, spacing of birth and sanitary conditions were related to weight and height of children independent of socio-economic status.

Horner et al (1981) investigated the factors affecting the growth in Nicaragua. Factors associated with 2nd and 3rd degree malnutrition were high birth order, early infancy, large household, high incidence of disease and physical handicaps.
Socio-economic and environmental indicators on nutritional status of rural Brazil children described by Victora *et al.* (1986) were family income, fathers education level, mothers education level, employment status of head of the family, number of siblings, family ethnic background, type of housing, degree of crowding and type of sewage disposal.

Mukerjee and Biswas (1959) conducted a study to investigate the probable relationship between the birth weight and gestation period and some other variables. The study showed that most of the births took place between 39 weeks and 41 weeks of gestation and the modal birth weight was in the range of 6-7 lbs. The average birth weight for males was found to be 6.01 lbs and for females 5.91 lbs. There was a tendency for the birth weight to increase with parity up to the 4th para. When birth weight was cross-tabulated with age of mother, it showed a positive correlation up to the age of 25, but after that it showed a tendency for the birth weight to decrease, with advancing age. In the case of primipara, the birth weight increased up to the age of 30 years and after that it started diminishing. Birth weight was found higher in the economically better group.

Vijay Kumar (1992) in his study concluded that the increase in birth weight to which birth spacing contributes brings in a higher quality of child life. This ensures maternal and child survival and decrease morbidity.

Mathai (1996) *et al.* reported that factors which influence birth weight are gestation at birth, sex of infant, birth order and maternal height. They concluded that birth weight percentiles for gestation when used should be adjusted for birth order, sex of infant and maternal height.

Ballweg (1972) stated that proportion of children under 2 years of age, who were severely malnourished is nearly 4 times greater than the proportion of five years
olds, so characterized. Even in India, Ghosh (1989) and several others reported that prevalence of malnutrition is highest between the age of 6 months and 2 years. NNMB data (1975-1989) also clearly showed that stunting increase with age, in pre-school children.

A study was conducted by Bagenholm et al (1988) to assess the growth and malnutrition among preschool children in Democratic Yemen. A high overall prevalence of wasting (8.7%) and Stunting (35.2%) was found among the children. However, rural children exhibited a satisfactory weight-for-height during the first 6 months of life compared with both the reference and the urban and slum children. Slum children had a high prevalence of wasting during the first 18 months of life. For the younger age groups, rural children were shorter than urban children, but at 7 years of age all the children were similar, with a mean height for-age corresponding to -1.7 standard deviations of that for the reference population.

The synergism between nutritional status and hospital admission due to diarrhea and pneumonia was studied by Victora et al (1990) in a population based birth cohort of > 5000 children in southern Brazil. Children were identified soon after birth in 1982 and data on nutrition status (weight and length) and hospital admissions were collected in 1984 and in 1986. Diarrhea admissions were stronger predictors of malnutrition was a more important risk factor for pneumonia than for diarrhea. All associations were stronger in the first 2 years of life, although the early effect of severe diarrhea and pneumonia on nutrition status could still be detected in the 4th year of life.

To assess the nutritional status of children below 5 years, 350 children were randomly selected by Vandana Sen et al (1980). 20.3% of the children were up to 12 months of age. 22.9%, 21.7% and 14.3% were in 25-36 months, 37-48 months and 49-
60 months of age groups respectively. According to weight for age method 68.6% of the children had varying degree PCM. The Weight/Height ratio over diagnosed 20.0% of the children while missed 16.7% of the children. The results obtained by this index were 83.3% sensitive and 80.0% specific. So the Weight/Height ratio 0.0015 was found to be nearly equally valid in comparison to weight for age method in detecting P.C.M and also it is the most useful age independent index.

A cross sectional study was conducted by Ray et al (1990) in a Predominantly Muslim Community to find out the nutritional status of the under-5 children and the factors responsible for it. The study showed that the overall prevalence of malnutrition was 57.9%. The factors identified for under nutrition include sex of the child being more in females, parental illiteracy, large family size and common infections.

Mehta et al (1998) conducted clinical assessment of nutritional status of neonate using CAN score and compared with other methods. CAN score <25 separated 60% of the babies as well nourished and 40% as malnourished-Weight for age and Ponderal Index classified 70-75% of babies as well nourished (AGA) and 25-30% as malnourished. Also MAC/HC classified nearly half the babies as well nourished and half as malnourished. In conclusion CAN score may be a simple clinical index for identifying fetal malnutrition and for prediction of neonatal morbidity associated with it, without the aid of any sophisticated equipment.

Walker et al (1992) conducted a study on stunted children of Jamaica. The children were assigned to supplementation. Weekly morbidity histories were taken for 2 years. Separate multiple regressions on each symptom for weight or length gain with coughing, apathy, anorexia and fever. Apathy and diarrhea reduced gains in length. Significant reductions in linear growth with lower respiratory-tract infections occurred only in non supplemented children. Growth over 4-month intervals was reduced if
diarrhea occurred in the first 2 months of the interval but there was no long-term effects of apathy, fever or anorexia. Some of the effects of morbidity on growth was therefore transient and morbidity is unlikely to be a major cause of growth retardation in this population.

Waterlow (1994) has critiqued various studies that examined the relationship of gain in height to gain in weight for children in developing countries. He reports that it is difficult to determine the relationship because of the physical difficulty of measuring gains in height, which are small over short periods of time.

Dayal (1980) reported that with increasing severity of malnutrition there was a highly significant fall in the performance of the intelligence scale and it also showed that the difference was much more marked in young children (1-6 yrs). Also, it was found that there was a marked improvement in intelligence after nutritional rehabilitation.

In order to assess the growth faltering and developmental delay in children with PEM, a study was conducted by Sathy et al (1991). It was observed that Anthropometric measurements, Somatic Quotient (SQ), Development Quotient (DQ), Motor Quotient (MOQ) and Mental Quotient (MEQ) in 136 children in the age group 1-24 months with varying degrees of protein energy malnutrition (PEM) were compared with an equal number of comparable well nourished children. There was a progressive reduction in SQ, DQ, MOQ and MEQ as the degree of PEM advanced. There was a direct linear correlation between SQ and DQ and between height and DQ in 4 degrees PEM. However, there was no direct correlation between head circumference and either DQ or MEQ.

Upadhyay et al (1992) assessed the morbidity, physical growth and behaviour development of infants. The study revealed that children having Grades II and III mal-
nutrition showed poor development in all the areas of behaviour i.e., motor, adaptive, language and personal social. Besides malnutrition environmental factors like mothers involvement in teaching, encouraging the child, talking to him or being within the visual range, the parental education, their caste and the child’s birth order contributed significantly to the development of the child during infancy.

Vazir et al (1998) observed that malnourished children attained developmental milestones at a later age. Developmental delay among the malnourished was especially observed in areas like vision and fine motor, language and comprehension and personal social. The delay was to the extent of 7-11 months in these areas in different age groups. Paternal involvement with child care especially father spending time, telling stories taking child for outing was found to be important for positive psychosocial development. Other factors included parents teaching child, small family size and paternal occupation, child’s appetite, observe of health problems, parental age and family having own have and electricity were the factors significantly related to better nutritional status of children.

Jesudasen et al (1978) demonstrated that in infants under nutrition was associated with low mental age and motor age. Further maternal under nutrition affected child’s nutritional status.

Chavez and Martinez (1982) using Gessell Schedule showed clear difference in motor development by 4 months, language 8 months, consistently poor adaptive and personal social behaviour in malnourished infants.

Powell and Granthan (1985) in preschool children developmental studies showed that housing, maternal education, working status contributed significantly to the variance in nutritional status but not in development.
Dagan et al (1983) conducted a study in the Negev Desert, Israel to assess the growth and nutritional status of Bedouin infants. Growth and feeding practices of 353 Bedouin infants were compared to those of 302 Jewish infants from the same area and to American standards. These two populations differed in their cultures and educational backgrounds. The feeding practices of Bedouin infants were markedly different from those of their controls. The Bedouin infants show a progressive decrease in weight, length, and head circumference, while the Jews were comparable to American. Data showed marked stunting in the presence of only mild malnutrition. This observation argues against the general belief that marked stunting is the result of prolonged severe malnutrition. Differences in cultural and genetic backgrounds, as well as different feeding practices and increased morbidity, could contribute to this phenomenon.

Gershoff et al (1988) conducted a study to determine the effects of providing high-calorie and vitamin-mineral supplement to preschool village children retarded in growth and development. The children were divided into 5 control and intervention groups. The interventions consisted of a village health program, high-calorie snacks and vitamin-mineral supplements. The supplements when used were provided in day care centres for preschool children. The health and nutrition interventions used did not significantly affect growth during the study period. Monthly changes in length and weight observed in this study indicate that growth patterns in Thai children are different from those seen in industrialized societies. Factors other than lack of nutrients and infection may be responsible for the inadequate growth often reported in developing countries.

Smith (1990) has reported that some of the nutritional deficiencies affect children’s concurrent mental functions.
SECTION - C

DEVELOPMENT
I: Early Scientific Beginning

Historically, attitudes towards childhood and child learning have varied widely. In the Middle Ages, for example, European adults largely ignored the period of childhood. They viewed children as infants until age 6 or 7; they considered older children to be small adults and treated them to adult conversation, jokes, music, food and other entertainment. In the sixteenth century, a revised image of childhood sprang from the religious movement that gave birth to Protestantism— in particular, from the Puritan belief in original sin. According to Puritan doctrine, the child was a fragile creature of God who needed to be reformed (Berk 1994). The seventeenth-century Enlightenment brought new philosophies of reason and fostered ideals of human dignity and respect. Conceptions of childhood appeared that were more human than those of centuries past (Berk 1994). In the eighteenth century, babies were no longer swaddled, children were dressed more comfortably, and corporal punishment declined. A new theory of childhood was introduced by the French philosopher of the Enlightenment, Jean-Jacques Rousseau (1712-1778). He viewed children as naturally endowed with an innate plan for orderly, healthy growth.

Scientific child study evolved quickly during the early part of the twentieth century. Scientists selected a child of their own or of a close relative for observation. Then, beginning in early infancy, they jotted down day-by-day descriptions and impressions of the youngster's behaviour. These were called baby biographies (Berk 1994). One of the most famous was Charles Darwin's about his son and perhaps the most influential were those of Jean Piaget, whose theories about how children learn, were based on observations of his own three children (Papalia 1994).
The baby biographies were clearly a step in the right direction. Preyer, set high standards for making observations. He recorded what he saw immediately, as completely as possible, and at regular intervals. He also tried not to influence the child’s behaviour or to let his own interests and interpretations distort what he saw. And he checked the accuracy of his own notes against those of a second observer. These are the same high standards that modern researchers use when making observations of children. As a result of the biographers pioneering efforts, in succeeding decades the child became a common subject of scientific research. (Berk 1994)

G. Stanley Hall (1844-1924) one of the most influential American psychologists of the early 20th century is generally regarded as the founder of the child study movement (Dixon and Lerner 1992). Inspired by Darwin’s work, Hall and his well-known student Arnold Gesell (1880-1901) developed theories based on evolutionary ideas. These early leaders regarded child development as a genetically determined series of events that unfolds automatically, much like a blooming flower. Gesell devoted a major part of his career to collecting detailed normative information on the behaviour of infants and children. His schedules of infant development were particularly complete, and revised versions continue to be used today. Gesell was also among the first to make knowledge about child development meaningful to parents. He provided them with descriptions of motor achievement, social behaviours, and personality characteristics (Gesell and Ilg, 1949) Gesell hoped to relieve parents’ anxieties by informing them of what to expect at each age. If, as he believed, the timetable of development is the product of millions of years of evolution, then children are naturally knowledgeable about their needs (Berk 1994).
Although Hall and Gesells work offered a large body of descriptive facts about children of different ages it provided little information on the how and why of development. Yet the child’s development has to be described before it could be understood.

Development can be defined as the changes in the structure, thought or behaviour of a person that occur as a function of both biological and environmental influences. Usually these changes are progressive and cumulative. They result in increased size of the person, increased complexity of activity and integration of organization and function. (Craig 1979).

Development of the child can be defined as the emergence and expansion of his capacities to provide great facility in functioning. This development is achieved through the process of growth, maturation and learning, which has two aspects of change quantity and quality. Development is more than a concept which can be easily observed and apprised. Development follows a pattern which is continuous, orderly, progressive and predictable. It is not limited to growing big. (Sharma 1995) It is concerned with changes that occur in children. It includes the way the children’s bodies grow and develop. Child development is concerned with the way the children think and learn, the way they feel about themselves and the way they interact with each other (Decker 1988)

Development refers to functional or non-organic changes and is usually qualitative in nature. Development refers to the process through which an individual grows up. As regards child development, the following statements define the field more precisely.

- Child development is an individual process.
- Child development depends on the heredity of individuals, the environmental factors and the interaction among them.
- Child development is the study of development and not merely change over time.
- Development is the result of the confluence of orgasmic and contextual variables (Srivastava 1998)
- Development is not merely change in physical size or proportions of adding inches or ability to ability. Instead, development is a complex process of integrating many structures and functions (Goel 1985).

II: Principles of Development

Development is a continuous process from conception to maturity (Illingworth 1996, Singh 1996).

The total period of development can be divided into the following stages.

- Pre-natal period-from conception to birth.
- Neo-natal stage-from birth to two weeks.
- Infancy-from two weeks to one year.
- Baby hood- from one year to two years.
- Child — hood: from two to 12 years.
- Adolescence-from 13 years onward (Sharma 1995).

The sequence of development is identical in all children but the rate of development varies from child to child. For example, a child has to learn to sit before he can walk, but the age at which children learn to sit and walk varies considerably (Illingworth 1996, Singh 1996).

Development depends on the maturation and myelination of the nervous system. Until that has occurred no amount of practice can make a child learn the relevant skill. When practice is denied, the ability to perform the skill lies dormant, but the skill is rapidly learnt as soon as opportunity is given (Illingworth 1996 and Singh 1996).
The direction of development is cephalocaudal; the infant initially develops head control followed by ability to grasp, sitting, crawling, standing, walking etc. (Illingworth 1996, Singh 1996 and Goel 1985).

In all the phases of development, whether motor or mental, the child's responses are of a general nature before becoming specific. It is a common observation that when shown a bright object, an infant shows wild excitement by moving trunk, arms, legs and babbling while an older child merely smiles and reaches for objects (Illingworth 1996, Singh 1996 and Goel 1985).

The development is orderly and proceeds in an unchanging sequence. Every child “Sits before he stands ... babbles before he talks ... draws a circle before he draws a square ... is dependent on others before he achieves dependence on self” - (Goel 1985).

It is observed that the rate of development for each child is constant. It is possible to predict at an early age the range within which the mature development of the child is likely to fall (Sharma 1995).

Each stage of development has some trait characteristic of its own. Some traits develop more rapidly and more conspicuously than others. Each phase is distinguished by a dominant feature, a leading characteristic which gives the period its coherence and unity. Upto the age of 2 years for example, the baby concentrates on his environment, growing control over his body and learning to speak. Adjustment to physical and mental decline, to changed patterns of living of work and social life dominate the latter years of life span (Bronson 1962).
III: Factors Influencing Development

The rate and pattern of development can be modified by external and internal conditions of the body. Some of the following factors, whose relative importance we shall not attempt to determine, influence development:

III.1: Sex

Sex plays an important role in the physical and mental development of the child. Differences in the rate of physical growth are especially apparent. Sex is indirectly influential on development in that the cultural pressures force the child to conform to the culturally approved pattern for his sex (Dinkmeyer 1967 and Sharma 1995).

III.2: Glands of Internal Secretion

These glands affect development in both prenatal and postnatal stages of growth. Deficiency in the activity of the sex glands delays the onset of puberty. Deficiency of parathyroid may result in defective bone growth and hyper excitability of the muscles. Thyroxin produced by the thyroid gland is essential to physical and mental growth.

III.3: Nutrition

At every age, but especially in the early years of life, feeding is of great importance for the development of the child. Not only is the amount of food eaten important; the quality of the food is vital.

III.4: Culture

The characteristics of infancy are universal. Culture begins to take its effect in the early training process and overlays or modifies a more basic substratum of behaviour.
III.5: Position in the Family

The position of the child within the family may influence his development through environmental factors. The second or third child within the family develops more quickly than the first born, not because of any pronounced intellectual difference, but because of the fact that the younger children may learn from imitating an older brother or sister.

III.6: Life Style-Self concept

The individual view of life and his evaluation of his world and his place in that world are factors in his development (Dinkmeyer 1967).

III.7: Estimation of the Part Played by Environment

The environment can greatly lower or raise the IQ score, and some feel that a really bad home can cause mental sub normality (Stott 1962). The Clarkes, discussing environmental factors in mental sub normality concluded on the basis of measured recovery being equivalent to the degree of organic psychological damage, that cruelty and neglect may retard intellectual development by at least 17 points. In twin studies they calculated that the environment might have an even bigger effect on the IQ.

Knobloch and Pasamanick (1962) studied the development of white and Negro children and found that whereas motor development remained comparable in the two groups, those aspects of development most subject to social influences showed considerable differences with increasing age. The adaptive behaviour quotient rose from 105.4 to 110.9 for white children and fell from 104.5 to 97.4 for the Negroes. Language ability likewise improved in the white children and decreased in the Negroes. Studies reveal that environment makes a significant difference in the activity level, and in the social, language, emotional and intellectual growth of children.
environment is important not only to the normal child, but to the handicapped child also (Illingworth 1987).

IV: Types of Development

- Motor Development
- Language Development
- Social Development
- Personality Development
- Emotional Development
- Cognitive Development

IV.1: Motor Development

Motor development is the development of control over bodily movements through the coordinated activity of the nerve centres, the nerves and the muscles. This control comes from the development of the reflexes and mass activity present at birth. Until this development occurs, the child will remain helpless (Hurlock 1978). Motor development is differentiated into gross-motor and fine motor areas in which skills involving large areas of the body (for example grasping, writing etc) are acquired (Vazir and Reddy 1998).

Motor development begins with the control of undirected body movements in general and proceeds to the control of the whole body. It follows the cephalocaudal development. The child first gains control over his head, then sits and finally achieves the erect posture and coordinated control over body movements. This enables him to get the characteristic erect posture and gait (Phatak 1990).

There are three main patterns in the infants motor development:

- Movements are slow because babies must think as they move.
- At first babies show general reactions to things in their world. Later in the first year, babies give more specific reactions to things they
see or hear. For instance, if babies are shown something they want, young infants wiggle all over, but older infants smile and reach for the object.

- Motor development occurs in two directions head to foot and centre to extremities (trunk outward) (Decker 1988).

IV.1.1: Principles of Motor Development

In numerous longitudinal studies, group of babies and young children have been tested and observed over a period of time to see when certain forms of motor behaviour appear and to discover whether these forms are similar for other children of the same age. Extensive studies show that various motor performances involving the arms, wrists and fingers, such as reaching, grasping and thumb opposition develop in a predictable sequence (Bayley 1965, Kravitz 1971, Rheingold et al 1962).

Many other studies have concentrated on motor performances involving the feet, legs and whole body, such as walking, jumping, running and hopping. In addition a few studies have been made of the age and sequence of development of specific skills such as those involved in self-feeding and self dressing, and throwing and catching balls (Scrutton and Robson 1984; Solomons et al 1968). From these studies some important principles of motor development have emerged. They are as follows.

Motor Development Depends on Neural and Muscular Maturation

Development of the different forms of motor activity parallels the development of different areas of the nervous system. Skilled movements cannot be mastered until the muscular mechanism of the child matures.

Learning of Skills Cannot Occur Until the Child is Maturationally Ready

Trying to teach the child skilled movements before the nervous system and muscles are well developed will be wasted effort. Such training may produce temporary gain but the long term effects will be insignificant or nil.
Motor Development Follows a Predictable Pattern

Motor development follows the laws of developmental direction. The predictable patterns of motor development is evident in the change from mass to specific activities. That motor development is predictable is shown by evidence that the age at which babies start to walk is consistent with the rate of their total development. A baby who sits early, for example, walks earlier than babies who sit later. Because of this consistency in rate of development, it is possible to predict with a fair degree of accuracy when a baby will start to walk on the basis of evidence of the rate of development in other motor coordination.

It is Possible to Establish Norms for Motor Development

Because early motor development follows a predictable pattern, it is possible to establish norms, based on mean ages, for different forms of motor activity. These norms can be used as guidelines to enable parents and others to know what to except and at what ages to expect it of their children. They can also be used to assess the normalness of a child's development.

There are Individual Differences in the Rate of Motor Development

Even though motor development follows a pattern that is similar for all in its broader aspects, individual differences occur in the detail of the pattern. These affect the ages at which different individuals reach different stages. Some of these conditions speed up the rate of motor-development while others retard it (Hurlock 1978).

IV.1.2: Sequence of Motor Development

Experimental studies of motor development have revealed that there is a normal pattern of achieving muscle control and have indicated the ages at which the average child is able to control different parts of the body.
Hurlock's has given following sequence of Motor Development.

**Head region**

- Ocular pursuit movements - 4 weeks
- Social smiles - 3 months
- Eye Coordination - 4 months
- In a prone position - 1 month
- In a sitting position - 4 months

**Trunk region**

**Turning**

- From side to back - 2 months
- From back to side - 4 months
- Complete - 6 months

**Sitting**

- Pulls to sitting position - 4 months
- With support - 5 months
- Without support - 9 months

**Organs of elimination**

- Bowel control - 2 years
- Bladder Control - 2-4 years.

**Arms and Hands**

- Defensive movements - 2 years
- Thumb-sucking - 1 month
- Reach and grasp - 4 months
- Grasp and hold - 5 months
- Picking up object with opposed thumb - 8 months

**Legs and Feet**

- Hitching (backward movement in sitting position) - 6 months
- Crawling - 7 months

**Crawling**

- On hands and knees - 9 months
- On all fours - 10 months

**Standing**

- With support - 8 months
- Without support - 11 months

**Walking**

- With support - 11 months
- Without support - 12-14 months
Bayley (1969) has given following Milestones for Gross and Fine Motor Development in the first two years.

<table>
<thead>
<tr>
<th>Motor skill</th>
<th>Average age Achieved</th>
<th>Age range in which 90% of infants achieve the skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When held upright head erect and steady</td>
<td>6 weeks</td>
<td>3 weeks- 4 months</td>
</tr>
<tr>
<td>2. When prone, lifts self by arms</td>
<td>2 months</td>
<td>3 weeks- 4 months</td>
</tr>
<tr>
<td>3. Rolls from side to back</td>
<td>2 months</td>
<td>3 weeks-5 months</td>
</tr>
<tr>
<td>4. Reaches for dangling ring</td>
<td>3 months</td>
<td>1-5 months</td>
</tr>
<tr>
<td>5. Grasps cube</td>
<td>3 months, 3 weeks</td>
<td>2-7 months</td>
</tr>
<tr>
<td>6. Rolls from back to side</td>
<td>4½ months</td>
<td>2-7 months</td>
</tr>
<tr>
<td>7. Sits alone</td>
<td>7 months</td>
<td>5-9 months</td>
</tr>
<tr>
<td>8. Crawls</td>
<td>7 months</td>
<td>5-11 months</td>
</tr>
<tr>
<td>9. Pulls to stand</td>
<td>8 months</td>
<td>5-12 months</td>
</tr>
<tr>
<td>10. Plays pat-a-cake</td>
<td>9 months, 3 weeks</td>
<td>7-15 months</td>
</tr>
<tr>
<td>11. Stands alone</td>
<td>11 months</td>
<td>9-16 months</td>
</tr>
<tr>
<td>12. Walks alone</td>
<td>11 months, 3 weeks</td>
<td>9-17 months</td>
</tr>
<tr>
<td>13. Builds tower of 2 cubes</td>
<td>13 months, 3 weeks</td>
<td>10-19 months</td>
</tr>
<tr>
<td>14. Scribbles vigorously</td>
<td>14 months</td>
<td>10-21 months</td>
</tr>
<tr>
<td>15. Walks upstairs with help</td>
<td>16 months</td>
<td>12-23 months</td>
</tr>
<tr>
<td>16. Jumps in place</td>
<td>23 months, 2 weeks</td>
<td>17-30 months</td>
</tr>
</tbody>
</table>

By looking at the above table we can see that there is organization and direction to the infants motor achievements. First, motor control of the head comes before control of the arms and trunk, and control of the arms and trunk is achieved before control of the legs (Cephalo-caudal trends) Second, motor development proceeds from the center of the body outward, in that head, trunk and arm control is mastered before coordination of the hands and fingers (Proximo-distal trend) (Berk 1994).
Following average miles stores have been given by wood (1974) in respect of motor development.

<table>
<thead>
<tr>
<th>Age in Months</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Head erect for few seconds</td>
</tr>
<tr>
<td>2</td>
<td>Head up when prone (Chin clear)</td>
</tr>
<tr>
<td>3</td>
<td>Kicks well</td>
</tr>
<tr>
<td>4</td>
<td>Lifts head and chest prone</td>
</tr>
<tr>
<td>5</td>
<td>Holds head erect with no lag</td>
</tr>
<tr>
<td>6</td>
<td>Rises on to wrists</td>
</tr>
<tr>
<td>7</td>
<td>Rolls from front to back</td>
</tr>
<tr>
<td>8</td>
<td>Sits without support</td>
</tr>
<tr>
<td>9</td>
<td>Turns around on floor</td>
</tr>
<tr>
<td>10</td>
<td>Stands when held up</td>
</tr>
<tr>
<td>11</td>
<td>Pulls up to stand</td>
</tr>
<tr>
<td>12</td>
<td>Walks or side-steps around pen</td>
</tr>
<tr>
<td>13</td>
<td>Stands alone</td>
</tr>
<tr>
<td>14</td>
<td>Walks alone</td>
</tr>
<tr>
<td>15</td>
<td>Climbs up stairs</td>
</tr>
<tr>
<td>16</td>
<td>Pushes pram, toy horse etc.</td>
</tr>
<tr>
<td>17</td>
<td>Picks up toy from floor without falling</td>
</tr>
<tr>
<td>18</td>
<td>Climbs on to chair</td>
</tr>
<tr>
<td>19</td>
<td>Climbs stairs up and down.</td>
</tr>
<tr>
<td>20</td>
<td>Jumps</td>
</tr>
<tr>
<td>21</td>
<td>Runs</td>
</tr>
<tr>
<td>22</td>
<td>Walks up stairs</td>
</tr>
<tr>
<td>23</td>
<td>Seats self at table</td>
</tr>
<tr>
<td>24</td>
<td>Walks up and down stairs (Papalia 1979)</td>
</tr>
</tbody>
</table>

**IV.1.4: Factors Controlling Motor Development**

Physical Status: Motor development to a great extent is controlled by physical status of the child. It is generally observed that the child with sound physical health has better motor coordination compared to the one having poor physical health (Sharma 1995) Weech and Campbell (1941) found a significant correlation between weight gain over a fifty-day period and sitting, creeping and walking.
Wright (1960) has presented an excellent analysis of the many ways that physical disabilities may influence the human personality which may in turn determine the motor skills that a child will attempt to acquire.

**Sex**

During infancy no sex difference are seen in activity level. But as the child enter social play age, these differences can be seen. The girls are seen playing passive games as compared to boys who indulge in blocks building etc. Phatak (1990) found stable sex differences in motor scores are conspicuously observed in the urban upper Socio Economic group but not in the lower Socio Economic group and in the rural group.

**Culture**

Many studies show that culture plays an important role in the development of motor skills. Each parent has its own concept of bringing up the child.

The hunter trains the child to walk first (Sharma 1995). What is normal and typical for children in one culture may not be so in another. The Arapesh in New Guinea, for example, hold their babies a great deal, “often in a standing position so that they can push with their feet against the arms or legs of the person who holds them. As a result infants can stand, steadied by their two hands, before they can sit alone” (Mead 1953).

Apparent differences in motor development have been demonstrated between black and white American children (Bayley 1965); between African, European and Indian Children (Geber and Dean 1957).

Robert Malina (1980) reviewing the findings of a number of studies involving babies from Europe and the United States, found that the median age for the onset of
walking was 11.4 and 14.5 months. This range is remarkably narrow given the complexity of walking activity. Super (1976) however, observed several cultures in East Africa in which infants began walking about a month earlier than those in most western societies. Care givers in these cultures believed it was important to teach babies to walk, and infants continued to exhibit the stepping reflex until walking began.

In still other cultures, walking begins surprisingly late. Among the Ache of Eastern Paraguay, children are significantly delayed in acquiring a host of motor skills, but the disparity is best illustrated by walking, reported not to begin until twenty one to twenty three months of age (Kaplan and Dove 1987). This small band of people, engaged in hunting and gathering, do not encourage the acquisition of motor skills in the infants.

**Intelligence**

Intelligence plays an important role in the development of motor activities specially during the first year of life. The dull children or less intelligent take longer time to sit, stand or walk (Sharma 1995). In Bayley’s study, the correlation between intelligence and motor development was approximately 50 at fifteen months of age. A number of studies have shown that intellectually retarded children as a group are somewhat retarded in motor development. Studies of intellectually gifted children as a group also reveal these children as some what accelerated in motor growth. (Thompson 1979)

**Individual Differences**

The maturity rate of each child is different which creates individuality in motor development. Most of the children crawl before they walk, however, some walk before they crawl (Sharma 1995). Although the order of motor milestones is similar across
children, there are large individual differences in the rate at which motor development proceeds. Each new skill is a matter of developing increasingly complex system of action. Besides maturation, motor development is affected by movement opportunities, infant rearing practices and a generally stimulating environment. (Berk 1994)

IV.1.5: Environmental Influences On Motor Development

The environment plays an important role in motor development, even though in most cases it is rather limited. There are two basic environmental variables that appear to be most closely related to motor development: opportunity for practice and motive-incentive conditions. The research literature leaves little doubt that the development of some motor skills is highly influenced by specific practice and formalized instruction. Although there are a number of basic motor skills in infancy which seem to be little affected by practice, many of the motor skills of early childhood appear to be seriously limited by the paucity and psychological restrictions of opportunities to experiment with, tryout, and consolidate developing motor abilities (Thompson 1979). The role of the environment is usually quite limited, although early experience can affect maturation rates in some areas, like vision (Lipsitt 1986). In general, when children are well fed and well cared-for, and have physical freedom and the chance to practice motor skills, their motor development will be normal (Clarke-Stewart 1973). When the environment is grossly deficient in any of these areas, development can suffer as in a classic study of three orphanages in Iran (Dennis 1960). Fortunately, such severe environmental deprivation is rare. But it is clear that the environment can play a part in motor development, and that the more restricted a child’s environment is the greater its effect will be.
IV.1.6: Stimulating Motor Development

In order to see whether motor development can be speeded up, a number of researchers have tried to train children to walk, climb stairs, and control the bladder and bowels earlier than usual.

In a classic experiment, Gesell (1929) studied a pair of identical twins. He trained twin T, but not twin C, in climbing stairs, building with blocks, and hand coordination. With age, however, twin C became just as expert as twin T; Gesell therefore, acknowledged the powerful influences of maturation on infants' behaviour. Even though this study was conducted more than 70 years ago and on only two infants- Gesell's conclusion still stands (Papalia and Sally 1994).

In a study of another pair of twins McGraw (1940) measured the effects of very early toilet training. She put one twin on the toilet every hour of every day starting at 2 months of age, the other twin was not put on the toilet until 23 months of age. The first twin did not begin to show some control until about 20 months and did not achieve consistent success until about 23 months; and the other twin quickly caught up. This shows that maturation has to occur before training can be effective.

While it is usually not advisable to attempt to speed up motor development for an individual child, developmental ages for certain skills do, appear to vary somewhat from one culture to another (Papalia and Sally 1994).

IV.1.7: Role of Nature and Nurture

Despite its importance, researchers have often over estimated nature's contribution to the emergence of motor skills (Parmelee and Sigman 1983). The lack of opportunity to engage in motor activities can seriously interfere with their acquisition. Evidence that motor skills do not simply follow a maturational course comes from observations of blind children. Even though blind infants achieve many
milestones at ages similar to the sighted, reaching for objects and crawling and walking are substantially delayed. These findings have led researches to design special programs to encourage blind infants to acquire self-initiated movement at an earlier age (Fraiberg 1977). Thus, a complete theory of motor skill development needs to give recognition to the contribution of both nature and nurture.

IV.2: Language Development

One of the most impressive developments in infancy and one that clearly reveals individual differences among children is the beginning of language (Stewart and Friedman 1987).

Roger Brown has defined language as an arbitrary system of symbols, which taken together make it possible for a creature with limited powers of discrimination and a limited memory to transmit and understand an infinite variety of messages and to do this inspite of noise and distraction (Brown 1973 b).

The critical element in this definition is the phrase infinite variety of messages. Language is not just a collection of sounds. Very young babies make several different sounds, but we do not consider that they are using language. They do not appear to use those sounds to refer to things or events and they do not combine individual sounds into different orders to create varying meaning. So far as we know, for example, it does not matter whether a 6 month-old says “Kakiki bababa” or bababa kikiki”- (Helen Bee 1989).

Language development refers to the development of phonology, syntax, semantics and pragmatics. Generally a distinction is made between language and speech (Harris 1983). But this distinction is more clear cut in theory than in practice. The Fuzzy boundary between these terms has prompted some researches to use them interchangeably.
IV.2.1: Phonological Development

Phonological development refers to the development of the sound system. Researchers in western have identified the following stages in development:

0-3 months: In this stage vocalizations began to be apparent. Language is used to express various emotions like pain, discomfort and hunger. Back vowels like /u/ and /o/ are vocalized in this stage.

3-6 months: Front vowels like /i/ and /o/ and mid-vowels like /a/ are produced in combination with consonants like /m/n/p/t/ and /d/ in this stage.

6-12 months: This period is full of babbling activity. This is often referred to as the pre-language stage, because most of the consonants and stress patterns are acquired through babbling. From the seventh month onwards the child repeats or echoes sequences of sounds. The first word also begins to emerge.

This sequence of development is said to be invariant across languages. Jackboson (1968) in his law of universal sequence claims that the phonemes common to all languages are acquired first. Phonemes specific to particular languages are acquired later (Srivasti and Devaki 1998).

IV.2.2: Syntactic Development

The development of syntax refers to how children combine words to make sentences. Syntactic growth is measured in two ways. One method is to administer tests and plot the course of development. This is usually done in an experimental situation. Another and a more frequently used method is collecting data from observation in the natural setting. In general, researchers have identified the following stages in syntactic growth.

Stage I: Two Word Utterance

This stage is noticed around 18 months of age. The child’s language consists of sentences that are of two words length. This stage has been variously called the
telegraphic speech (Brown and Fraser 1963), Pivot grammar (Braine 1963) and Open-close (Glietman and Wanner 1982).

**Stage II: Development Of Morphology**

Morphology consists of two aspects, inflections and derivations. The child begins to acquire inflections from the age of 2 years, and derivations much later. Brown (1973 a) after an extensive study has provided an order of development of morphology with present progressives (verbs with ‘ing’ as the marker as in going, eating etc.) coming first. This order has received support from other studies (J.G.de Villiers and P.A de Villiers 1973: Devaki 1992)

**Stage III: Development of Negatives and Questions**

After the development of morphology, children begin to acquire sentences. The development of negatives has been studied in Telugu. The findings of Telugu show three developmental stages namely (a) Negatives showing non-existence develop first (b) Negatives showing denial develops next, and (c) Negatives showing rejection develops last. These findings are slightly different from those reported by Vaidyanathan (1984) in Tamil and by Bloom (1970) in English. Vaidyanathan reports that rejection develops first followed by non existence and prohibition and denial. Bloom, however, reports that non-existence develops first, followed by rejection and denial (Srivastava 1998).

**IV.2.3: Semantic Development**

It deals with the issues of how children acquire meaning. Semantic development takes place with extraordinary speed as preschoolers foot map thousands of words into their vocabularies. Although individual differences exist, object words are emphasized first, action and state words, increase later. Errors of under extension and over extension gradually decline as preschoolers enlarge and refine their
vocabularies. During middle childhood, understanding of word meanings become more flexible and precise. Adolescents acquire many abstract words and grasp subtle non literal word meanings. Adult feedback assists with word learning, but a major role is played by the child’s cognitive processing (Berk 1994).

IV.2.4: Pragmatic Development

The development of pragmatics refers to the use of language in every day interaction.

Besides phonology, vocabulary, and grammar, children must learn to use language effectively in social contexts. For a conversation to go well, participants must take turns, stay on the same topic, state their messages clearly, and conform to cultural rules that govern how individuals are supposed to interact. During the preschool years, children make considerable headway in mastering the pragmatics of language. (Berk 1994)

Pragmatic development has been dealt with diversely by western researchers. It is seen either as a part of semantic development by Pease and Berko (1985) Lee (1986) as a part of socio-linguistic development by Destelano (1978) and Kuczaj (1984) referred it to as discourse development and as components of inter and intra-personal communication skills by Dickson (1981) (Srivastava 1998).

Several scholars have presented a developmental perspective of pragmatic development. These may be summed up in terms of the following 3 stages (Ingram 1989)

Stage I: This stage applies to the earliest months wherein the child responds to adult’s acts by some acts or sounds.

Stage II: This stage occurs at the end of the first year and the child responds to adults speech by some acts and to adults act by speech.
Stage III: This stage begins from 1.6 years onwards and the child responds to adults speech by speech.

IV.2.5: Stages in Language Development

**STAGES IN LANGUAGE DEVELOPMENT**

Following are the language milestones from birth to 2 years.

<table>
<thead>
<tr>
<th>Age</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>Baby can perceive speech, cry, make some response to sound</td>
</tr>
<tr>
<td>1½ to 3 months</td>
<td>Coos and laughs</td>
</tr>
<tr>
<td>3 months</td>
<td>Plays with speech sounds</td>
</tr>
<tr>
<td>5-6 months</td>
<td>Makes consonant sounds, trying to match what she or he hears.</td>
</tr>
<tr>
<td>6-10 months</td>
<td>Babies to understand words (usually “no” and baby’s own name), imitates sounds.</td>
</tr>
<tr>
<td>9 months</td>
<td>Uses gestures to communicate and plays gesture games.</td>
</tr>
<tr>
<td>10 months</td>
<td>Loses ability to discriminate sounds not in own languages.</td>
</tr>
<tr>
<td>10-14 months</td>
<td>Says first word (usually a label for something) imitates sounds.</td>
</tr>
<tr>
<td>13 months</td>
<td>Understands symbolic function of naming</td>
</tr>
<tr>
<td>14 months</td>
<td>Uses symbolic gesturing</td>
</tr>
<tr>
<td>16-24 months</td>
<td>Learns many new words, expanding, vocabulary rapidly, going from about 50 words to up to 400; uses verbs and adjectives; speaks 2 words sentences.</td>
</tr>
<tr>
<td>18-24 months</td>
<td>Says first sentences</td>
</tr>
<tr>
<td>20 months</td>
<td>Uses fewer gestures, names more things.</td>
</tr>
<tr>
<td>24 months</td>
<td>Uses many 2-word phrases, no longer babbles, wants to talk.</td>
</tr>
</tbody>
</table>

*Source of Milestones:* Bates, O'Connell, and Shore 1987; Capute, Shapiro and Palmer 1987

The stages of language development are pre speech, the first words, the first sentences and the early syntax.

*Pre speech*

The words infant is based on the latin-for “without speech”. Before Stefan said “Dada” or Anna said “Hi”, both like all normal infants, made a variety of sounds that
progressed in a fairly set sequence from crying to cooing and babbling, accidental imitation, and then deliberate initiation. These sounds are known as pre-linguistic speech (Papalia and Olds 1994).

Babies can distinguish between sounds long before they can utter anything but a cry. In the first months of life, they can tell apart similar sounds like bah and pah (Limas et al 1971). This ability to differentiate sounds seems to be an inborn capacity that people love as they hear the language spoken around them. Babies seem to lose this ability at about 9 or 10 months of age, when they begin to understand meaningful speech, but before they are physically mature enough to produce their own.

At anywhere from 6 weeks to 3 months of age, babies start to laugh and coo when they are happy, making squeals, gurgles and vowel sounds like ah. A kind of “vocal tennis” begins at about 3 months, when they begin to play with speech sounds, producing a variety of sounds that seem to match the ones they hear from the people around them (Bates et al 1987).

Cross-cultural studies—like one that looked at babies growing up in French-, Chinese, and Arabic-speaking families—found that babies do not, as was once believed, “try out” all speech sounds in all human languages, but instead move in the direction of their own language (Boysson et al 1984).

Babbling—repeating consonant-vowel strings like mama-ma-ma—occurs rather suddenly between 6 and 10 months of age, and these strings are often mistaken for a baby’s first word. Early babbling is not real language, since it does not seem to have meaning for the baby, but it becomes more word like, leading into early speech (Dore 1975).
At first babies accidentally imitate sounds they hear. Then they imitate themselves making these sounds. At about 9 to 10 months of age they deliberately imitate other sounds, without understanding them. Once they have this basic repertoire of sounds, they string them together, in patterns that sound like language but seem to have no meaning (Lenneberg 1967).

This pre-linguistic speech can be rich in emotional expression starting at about 2 months, when infants cooing begins to express contentment, the range of emotional tone increase steadily. Long before children can express any ideas in words, parents become attuned to their babies feelings through the sounds they make (Tonkova-Yompoli 1973).

Babies understand many words before they can say them. The first words most babies understand are either own names or the word no. They also pick up other words with special meaning for them, and parents sometimes have to start spelling words in front of 14- months old if it is not time yet to give them their b-a-n-a-n-a (Papala and Old 1984).

By the end of the first year the baby has some sense of intentional communication, a primitive idea of reference, and a set of signals that serve to communicate with the baby’s familiar caregivers (Bates et al 1987). The linguistic stage is now set for speech.

**First Words**

The average baby says his or her first word some-time between 10 and 14 months, initiating linguistic speech - the use of spoken language to convey meaning. Before long the baby will use many words and will also show some understanding of grammar, pronunciation, intonation, and rhythm (Papalia and Old 1984).
Typically by 15 months of age a child of either sex has spoken 10 different words or names (Nelson 1973) Vocabulary continues to grow throughout the single-word stage (which tends to last until the age of about 18 months). The sounds and rhythms of speech grow more elaborate, and even if much of the child’s speech is still babbling it does seem quite expressive.

In studying the first 50 words spoken by a group of 1-and 2 year-olds, Nelson (1973, 1981) found the most common were names of things, either in the general sense (“oof-oof” for dog) or the specific (“Unga”) for one particular dog). Others were action words (“bye-bye”), modifiers (“hot”), words that express feelings or relationships (the ever-popular “no”), and a few grammatical words (“for”).

By 13 months most children seem to understand the symbolic function of naming; that is, they realize that a word stands for a specific thing or event. They add words slowly to their vocabulary until a “naming explosion” occurs somewhere between 16 and 24 months, and the baby goes from saying about 50 words to saying about 400 within a few weeks (Bates et al. 1987).

First Sentences

The age at which children begin combining words varies, although the range is similar for children who learn spoken language and children of deaf parents who learn sign language. Generally they put words together between 18 and 24 months of age, about 8 to 12 months after the first word, but this is very variable. Although pre-linguistic speech is fairly closely tied to chronological age, linguistic speech is not. Knowing a child’s age tells us very little about his or her language development, according to Roger Brown (1973 a) who has studied this phase of language acquisition.


*Early Syntax*

Sometimes between the ages of 20 and 30 months, children acquire the fundamentals of syntax. They begin to use articles (a, the), prepositions (in, on), plurals, verb ending and forms of the verb to be (am, are, is). By 3 years of age, their speech becomes longer and more complex, although they omit many parts of speech, they get their meaning across, and they are fluent speakers (Brown 1973a, 1973b). Language continues to develop, of course, and by late childhood, children are fully competent in grammar, although they continue to enlarge their vocabulary and improve their style.

**IV.2.6: Individual Differences in Language Development**

The rate of development differs considerably from one child to the next. The first word usually is heard when the child is somewhere around one year old. Yet it is not at all uncommon for the first word to be delayed until 14 or 16 months.

*Sex Difference*

In early research the results showed that girls were considerably superior in language development in the first few years of life. But this definitely does not mean that every female is better than every male.

*Social Class Difference*

The usual assumption is that poor children have less good language. The poor children seem to know fewer words. The clear reason for this is that middle or rich class children get to talk more from the earlier days of life and are exposed to many more words. Lower-class mothers, use a restricted language code, talking to their children in short, simple and easily understood sentences. Social contacts and relationship of the child have an important influence on speech development (Hurlock 1965).
Early Verbal Exchange

In conversation initiated by adults, two year olds often simply repeat what the adult says. Mc Carthy (1950) cites research evidence which indicates that children who associate with adults show greater linguistic acceleration than those who associate with other children.

Intelligence

The intellectually gifted child usually speaks earlier and more efficiently. While the mentally defective child speaks later and articulates poorly. Most psychologists agree that intelligence advances are fundamental for language development.

Hearing

Babbling sound which is product at about five to six months is to an extent determined by maturation. The continuation of babbling, depends on feed-back children hearing themselves and on social stimulation (hearing others and responding to them).

Health

The severe and prolonged illness during the first two years of life delays the beginning of speech and the use of sentences. Most of the needs are readily fulfilled by the adults around him thus he has little incentive to talk. Hurlock cites evidence to show that physical condition has a important influence on the development of speech.

Personality

A shy withdrawn, who avoids communication with others speaks less than the one who is a mixing kind and promotes communication with everyone around him. (Sharma 1995)
IV.2.7: The Influence Of The Environment On Language Development

Early theories: Imitation and Reinforcement

The earliest attempts to explain language development were primarily based on learning theory approaches and on the common sense idea that learning a language was a fairly straightforward process of imitation or reinforcement.

Imitation

It obviously has to play some part, since the child does learn, the language he is hearing and doesn’t invent his own. Children do imitate sentences they hear; they do repeat the name of some new object when they hear it (Leonard et al 1983); they do learn to speak with the accent of those they are listening to. There is even some evidence from research by Elizabeth Bates (Bates et al 1982) that those babies who show the most imitation of actions and gestures in the first year of life are also the ones, who later learn language more quickly, thus, the tendency to imitate may be an important ingredient in the language-learning process.

Reinforcement

A more formal theory of language development based on learning theory was proposed by Skinner. He argued that children are directly taught language by their parents or others around them. The adults, he thought, shape the child’s first sounds into words and then words into sentences by selectively reinforcing those that are understandable or “correct”. If your child says “coo” while reaching for a cookie and you say “No say cookie” and withhold the cookie until she says something closer, you are shaping the child’s language (Bee 1989).

Newer Environment Theories: Talking to the Child and Other Input Theories

The children who hear a lot of language develop vocabulary a little faster in the early years than do those who are talked less (Engel et al 1975). But it may not be
sheer quantity that is critical here; rather, it seems that those infants whose parents use language responsively—who talk to the infant when the baby makes some noise or in response to some other behaviour of the child later—are slightly faster in language development (Clarke-Stewart 1973; Olson et al. 1986).

**Motherese**

Adults typically speak to young children in a special, simplified way called motherese. Motherese consists of short, simple sentences that may be repeated in different forms for emphasis (Stewart and Friedman 1987). Since this distinctively simpler language is most often heard from mothers to their youngsters, it has acquired the name motherese (Snow and Ferguson 1977; Schachter and Strage 1982).

**Motherese has several key features:**

- It is spoken in a higher-pitched voice and at a slower pace than is spoken to adults, with clear pauses at the ends of sentences (Jacobson et al. 1983).
- The sentences are short and nearly always grammatical.
- The sentences are grammatically simple, with relatively few modifiers and few clauses.
- It is highly repetitive.
- The vocabulary is concrete, nearly always referring to objects or people that are immediately present.
- As the child’s sentences become longer and more complex, the adults’ language moves ahead slowly in length and complexity, always a notch or two ahead of the child (Bee 1989).

Today, some researchers question the value of motherese, arguing that complex rather than restricted speech by parents leads to fast, accurate language development by children. These investigators contend that it is what children select from what they hear, rather than what adults pre-select for them, that is most important in learning language (Gleitman, Newport and Gleitman 1984).
Other researchers, however, still find positive correlation's between use of motherese and the rate of 2 years old's language growth (Hoff-Ginsbery 1985)

IV.3: Social Development

Social development is acquisition of the ability to behave in accordance with social expectations (Hurlock 1978). The social development of the child is associated with other features of his growth. The child as he grows up not only develops in physical, mental, emotional and attitudinal behaviour but, side by side with his social behaviour also.

Each child develops within a specific social setting the nature of the specific life space has an influence upon his learning experiences and how he feels about them. Each culture, and to an extent, each group to which the individual belongs, furnish a set of expectations and relationship which influence the eventual development of social skills, behaviours and attitudes. Social contact is necessary for normal development. The child develops through the stimulation which he receives from other people. Human behaviour is learned in the daily interactions with parents, siblings and eventually significant others (Dinkmeyer 1965)

IV.3.1: Developmental Trends in Social Growth

We know that as children grow older the amount of social play increases between them and that they make more friends as they grow from infancy to kinder garden age (Rubin 1977). They also increasingly tend to select friends who are of the same sex (Hagman 1933). Role taking increases as child becomes older (Flavewl 1966).

In the past decade the influence that peer groups have on the social development of their members has drawn increasing attention (Hartup 1983). It is evident that the attitudes of their peers become of growing importance to the child
during these early years as these groups make it clear to their members that they favour positive, friendly behaviour and dislike aggression and selfishness (Hartup et al. 1967). Such groups rate socially competent children highly and these attitudes, which are often frankly expressed, help shape the behaviour of the children in the group. Then too, as children become 4 or 5 years old they turn to their peers more frequently for help than they turn to adults for it (Stith and Connor 1962) and this aid seeking promotes more opportunities for positive social interactions.

Following are the progress indicators of social development for 1st 2 years:

<table>
<thead>
<tr>
<th>Behaviour items</th>
<th>Age expected (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Responds to smiling and talking</td>
<td>6</td>
</tr>
<tr>
<td>2. Knows mother</td>
<td>12</td>
</tr>
<tr>
<td>3. Shows marked interest in father</td>
<td>14</td>
</tr>
<tr>
<td>4. Is sober with strangers</td>
<td>16</td>
</tr>
<tr>
<td>5. Withdraws from strangers</td>
<td>32</td>
</tr>
<tr>
<td>6. Responds to bye-bye</td>
<td>40</td>
</tr>
<tr>
<td>7. Responds to inhibitory words</td>
<td>52</td>
</tr>
<tr>
<td>8. Plays pat-a-cake</td>
<td>52</td>
</tr>
<tr>
<td>9. Waves “bye-bye”</td>
<td>52</td>
</tr>
<tr>
<td>10. Is no longer shy towards strangers</td>
<td>1-3</td>
</tr>
<tr>
<td>11. Enjoys imitation of adult activities (smoking etc)</td>
<td>1-3</td>
</tr>
<tr>
<td>12. Is interested in and treats another child like an object rather than a person</td>
<td>1-6</td>
</tr>
<tr>
<td>13. Plays alone</td>
<td>1-6</td>
</tr>
<tr>
<td>14. Brings things (Slippers etc) to adult</td>
<td>1-6</td>
</tr>
<tr>
<td>15. Shows beginning of concept of private ownership</td>
<td>1-9</td>
</tr>
<tr>
<td>16. Wishes to participate in household activities</td>
<td>1-9</td>
</tr>
<tr>
<td>17. Has much interest in and watches other children</td>
<td>2</td>
</tr>
<tr>
<td>18. Begins parallel play</td>
<td>2</td>
</tr>
<tr>
<td>19. Is dependent and passive in relation to adults</td>
<td>2</td>
</tr>
</tbody>
</table>

Abridged from the longitudinal study of Individual Development, by L.H. Stott, Detroit: The Merrill-Palmer Institute. Copyright 1955 by the Merrill-Palmer Institute. The ages should be regarded as approximate.
IV.3.2: Socialization in Early Years of Life

Socialization is the process by which children learn the standards, values and expected behaviour for their culture or society. Socialization occurs through parents serving as models of behaviour, expressing, accepting and warmth, providing restrictions or freedom, and punishing unacceptable behaviour. This process starts from the day the child is born. As he grows his social needs increase, his peer group fulfills some of his essential needs. Mere observations becomes one mean of socialization.

The attachment relationship that begins in the first year forms an important basis of socialization in the later years. Home environment is very important for socialization process. All the family members and their relationship with the child favour the development of good social attitudes and help the child to become a social person. The way the parents rear a child, also has an influence. If the child's need in his childhood are not taken care of or not fulfilled, he is likely to acquire certain antisocial behaviours (Sharma 1995).

Although opinion remains divided about how children become socialized (Maccoby and Martin, 1983), it appears children learn to become like other people and to get along with them as a result of identifying with and imitating them and also by being reinforced for desirable social behaviours.

Considerable evidence indicates that children learn by observing grown-ups and other children and that, particularly if the person is nurturing and powerful, they will seek to be like the model and imitate his behaviour (Bandura 1977; Bandura and Huston 1961; Mischel and Grusec 1966).
Research indicates that children also learn socially acceptable responses as a result of reinforcement either by adults (Allen et al; 1964; Horowitz 1967) or by peers (Furman and Masters 1980). The quality of emotional attachment between mother and child is an additional important influence on socialization. Children who are closely attached to their mothers tend to be more compliant, that is, conform more readily to the wishes and instructions of their families as well as better liked and accepted by their peers (Sroufe 1983).

IV.3.3: Infant Communication

Infants communicate with those around them with their appealing baby ness, gazes, vocalization, smiles, laughter and cries. They communicate by facial expressions and bodily gestures. Mothers interpret babies expression and gestures as communications even when the baby is not intentionally sending messages. Eventually, the infant does learn to communicate and becomes a truly interactive partner in these social exchanges (Stewart and Friedman 1987)

*Baby ness*

Human babies, like puppies, kittens, calves, and colts, have a special appeal. This cute baby ness equips infants with a powerful means of attracting the nurturance they need. Ethologists maintain that baby ness helps to ensure the infants survival (Bowlby 1969; Lorenz 1971). It keeps adults near by and interested in feeding, sheltering and stimulating their offspring.

*Gazing*

Babies also communicate with the people around them by gazing. When infants are held close, they can see their parents face and hair or a proffered hand or toy. During feeding and play, parents hold their infants at a distance that is well within the infants visual window. That interesting face, as Mom or Dad talks to and looks at
the infant, turns feeding and playtime into excellent opportunities for forming social and emotional ties (Stewart and Friedman 1987).

When infants are about 6 weeks old, their visual and motor systems have matured enough so that they can focus on their mothers' eyes, with their own bright eyes wide open. When they are about 3 months old, infants become able to maintain eye contact with their mothers to gaze into their eyes for several seconds, and the mothers' feelings of attachment to the infant deepen. The infants' intent gaze not only affects how the mother feels but it also communicates a useful message about how the infant is feeling. Gazing is an effective means by which the infants communicate with parents (Stewart and Friedman 1987).

**Vocalizing**

Vocalizing is another means by which the infant communicates. For the first few months, the infants' vocal sounds are coos and gurgles. By about 4 months, infants utter relaxed consonant and vowel sounds when they hear their parents' voices or see their faces approaching. They string these sounds together 'bababababa' 'dahdahdah' in sentence-like patterns. This babbling is vocal play, not a deliberate attempt to say something. Infants vocalize in this way even when there is no one around to listen. But although infants do not intend these sounds to convey meaning, parents react to them. While the infant is vocalizing or right after, the mother is likely to speak (Jones and Moss 1971). The infants' vocalization is a means of communicating with parents who are willing to listen.

**Smiling And Laughing**

Smiles and laughter are arguably the infants' most irresistible means of communicating. During the first two weeks of life, infants ordinarily smile when they
are drowsy or sleeping lightly rather than when they are awake. In the second two
weeks of life, smiles can be coaxed from infant by gentle stimulation while they are
awake. These early smiles look like later smiles, and like later smiles they arise from
arousal and relaxation. But it will be another few weeks until the infant is smiling with
real pleasure. When infants are about 1 month old, they begin to smile exogenous
smiles that are responses to events in the outside world. The 15 month old smiles after
he has done something like more a ball and then shows his mastery by moving it again.
His smiles how that in his earliest months of life, he already takes pleasure from
learning and doing (Stewart and Friedman 1987).

Laughter is another sign of joy. Laughter is also a reaction to arousal and a fine
means of communication, like smiling. Infants begin laughing when they are 3 or 4
months old. 5 months old laugh when they are jiggled and tickled under the chin and
also when Mom or Dad plays peekaboo. Laughing, like smiling, happens first in direct
response to an event and later in response to the infants interpreting expecting or
participating in the event (Sroufe 1979).

Making Faces and Gestures

Another means by which infants communicate with others is by the gestures of
their arms and legs and the expressions on their faces- their frowns and furrows, glares
and grimaces. Even young infants faces show expressions that in adults indicate
pleasure and displeasure, anger and fear, joy, surprise, sorrow, disgust (Charlesworth
and Keutzer 1973). Parent interpret babies facial expressions and gestures as
communication. In interactions, infants learn that others will react in particular ways to
their expression and gestures. Parents also learn to interpret the infants signals
accurately (Stewart and Friedman 1987).
IV.3.4: Social Milestones during the 1st year of life by Newson, 1977

*Birth To 3 Months: The Dance Begins.*

- Fixes eyes on parents eyes and hold gaze.
- Smiles at a nodding head or high voice.
- Smiles at parents face (the first social smile)
- Cries when parents does not interact as usual
- Discriminates between sight of parents and others.

*3 To 6 Months: Emotions Appear*

- Laughs
- May act wary with strangers
- Acts differently towards parents and other people

*6 To 12 Months: Focused Relationships Develop*

- Laughs at incongruity
- Acts fearful with strangers in threatening situations.
- Acts as a real partner in social interactions
- Deliberately seeks out and stays near parents.

IV.3.5: Influences of Culture and Economic Status on Social Behaviour

Children differ in their social behaviour at any stage of their development on account of great influence which is exercised on them by the culture or customs in which they are born or live. The effect of customs is also visible quite clearly in the activities of children. Children born in poor families, play more or less such which are relative to the customs prevailing in their families. The economic status of the family is also more often responsible in developing the varying social behaviour patterns in children. A child born in a low family may not be able to adjust himself socially well,

Social development takes place in each and every child but individual differences are there which can be noticed from the very infancy among children. The reasons for these individual differences are quite complex to comprehend clearly. But
they may be on account of the training and education of the children or on account of the environment.

IV.4.1: Personality Development

The term personality is one of the slipperiest in all of psychology-personality describes a broader range of individual characteristics, mostly having to do with the typical ways each of us interacts with the people and the world around us. Concept of personality is not reduced to numbers like an IQ score. Children do not have an amount of personality; they have a kind or type of personality, a style or pattern (Helen Bee 1989).

According to Allport (1961) personality is the dynamic organization within the individual of those psychophysical systems that determine the individual’s unique adjustments to the environment. (Hurlock 1978)

*Personality Development In Infants*

Researches concerning early influences on the development of personality and character are a great deal to the stimulation received from the pioneering work of Sigmund Freud (Mehta 1964). Freud believed that personality is decisively formed in the first few years of life, as children deal with conflicts between their biological, sexually related urges and the requirements of society. Freud proposed that the conflicts occur in a series of psychosexual stages, each of which centres on a particular part of the body and its needs. Two of these stages occur during the first 3 years of life (Papalia and Old)

IV.4.2: Some Important Personality Determinants

Some of the determinants of personality have their greater effect on the core of the personality pattern. How much influence different factors will have on personality
development will depend to a large extent upon children's ability to understand the significance of the factors in relation to themselves.

Early Experiences

Unhappy childhood experiences has a lasting effect on personality by making the individual feel insecure. Studies of the effects of early experiences have shown that experiences and the memories of them, even though Vague, are highly influential because they leave an indelible impression on the child's self concept. The attitude and emotional reactions of parents, the total cultural context of the environment in which the child grows up, and other factors in the child's total experience are of great importance in determining the pattern of personality (Baumrind 1967).

Cultural Influences

The cultural group to which children's; parents belong sets the model for the approved personality pattern. Children learn to behave in a way that is socially approved in their culture. In many cultures, children are trained to be family oriented. As a result they develop personality patterns, characterized by loyalty, cooperation, self-sacrifice, and often-unrealistic concepts of themselves and their roles in life. In cultures that are more individual oriented become more egocentric, more anxious to help themselves than others (Hurlock 1978).

Physique

Physique, or body build, influences personality both directly and indirectly. Directly, it determines what children can and cannot do. Indirectly it determines how children feel about their bodies. This in turn is influenced by how significant people in their lives feel about them (Lester 1974).

Children who are markedly different from their age makes in physique often develop some compensatory behavior, such as clowning and showing off. This leads
to non favourable social reactions that reinforce the non favourable social reactions to their physiques (Hurlock 1974).

**Physical Condition**

There are two aspects of children's physical conditions that affect their personalities—general health and physical defects. Not only does good health enable children to engage in the normal activities of their age groups but it also has a favourable effect on their personalities. Children who are delicate and sickly develop a feeling of inferiority and martyrdom because they cannot engage in the activities of their health age mates (Mattson 1972). The more different the defects make children from their age mates, the greater will be their beliefs to their inferiority, inadequacy and martyrdom.

**Attractiveness**

It is assumed that those who are attractive have more desirable personality characteristic than those who are unattractive. This reinforces favourable social attitudes towards them (Kleck et al 1974). At an early age, attractive children sense favourable social attitudes towards them and this influences their self concept favourably. As a result, they are more self-confident more relaxed, and more friendly and gracious than are children who are less attractive (Dion et al 1972). Just because attractiveness of appearance leads to favourable personality characteristics it does not mean that the more attractive children are the more favourable their personalities will be (Hurlock 1978).

**Intelligence**

Children whose intelligence is definitely below that of other children of the same age usually find themselves as outsiders in the peer group. Because of their narrow social experiences, owing to lack of social acceptance by peer, dull children
tend to have poor social insight. This further impairs their social adjustments and adds to their social rejection. Fortunately, dullness does not damage the personality pattern as much as one might anticipate. The reason for this is that most dull children lack the social insight to realize how unfavourable social attitudes towards them are (Gottlieb 1975).

**Emotions**

Suppression of emotional expressions results in moodiness, which tends to make the individual rude, uncooperative, and preoccupied with self. Heightened emotionality, tends to make one nervous and ill at ease; it is often accompanied by specific mannerisms, such as nail biting, giggling (Hurlock 1978). When emotions are so strong that behaviour becomes disorganized, they will adversely effect children’s characteristic patterns of adjustment. By doing so, they have a profound effect on their personalities by leading to unfavourable self-concepts (Alland 1976).

**Names**

A name, per se, has little effect on the self concept. Its influence is felt only when children realize how it affects significant people in their lives. If a child suspects or have reason to believe that others react unfavourable to their names, it will have a damaging effect on their self concepts. Nicknames or pet names have a profound effect on their personalities. As children grow older and are called by family names will these names begin to have an effect on their personalities (Hurlock 1978).

**Success and Failure**

Failure, not only damages the self-concept but it encourages the development of patterns of behaviour that are harmful to personal and social adjustments. These harmful effect come from children’s realization of the unfavourable evaluation of others as well as from their own self-evaluations. By contrast, success leads to
favourable self concepts which in turn, lead to good personal adjustments and favourable social evaluations. These contribute heavily to good future adjustments (Hurlock 1978).

Social Acceptance

Social acceptance influences every child's desire to develop socially approved personality traits and it affects the self-concept favourably. Social acceptance plays a large role in the development of the self concept. Children who are friendly and self-confident, in turn, win more friends, as their popularity increases, their poise, self assurance and leadership qualities also grow stronger. By contrast, unpopular children feel inferior, they are envious of their popular age mates, they become sullen, irritable. These reactions do not help them to develop the personality traits that will improve their acceptance (Hurlock 1978).

Other influences which can affect personality of a child are status symbol, school influences and above all family influence. How great an influence the family has on personality development has been expressed in the following way by an anonymous writer:

- If a child lives with criticism, he learns to condition.
- If he lives with hostility, he learns to fight.
- If he lives with fear, he learns to be apprehensive.
- If he lives with pity, he learns to feel sorry for himself.
- If he lives with tolerance, he learns to be patient.
- If he lives with jealously, he learns to feel guilty.
- If he lives with ridicule, he learns to be shy.
- If he lives with shame, he learns to be ashamed of himself.
- If he lives with encouragement, he learns to be confident.
- If he lives with praise, he learns to be appreciative.
- If he lives with acceptance, he learn to love.
• If he lives with recognition, he learns to have a goal. If he lives with honesty, he learns to value truth.
• If he lives with security he learns to have faith in himself and others (Hurlock 1978).

IV.5: Emotional Development

Emotions involve feelings, impulses toward action, and the subjective element of perception that produces the feelings and impulses (Jersild 1960) for our purposes, expressions of feelings that exceed mildness and become intense will be considered as emotions. Emotions play a significant role in the development of the child. Some believe that emotion is prior to all experiences and is fundamental to them to the extent that all learning is acquired in emotional terms (Dinkmeyer 1967).

From the beginning of life infants are social beings: Infants emotion’s are central aspect of early development. The emotional state of infants differ from those of adults. Partly because infants do not consciously evaluate there feelings the way adults do (Sharma 1995) Babies begin to express emotion during the first year of life. Emotions continue to be important throughout their lives (Decker 1988). Very soon after birth, babies show signs of interest, distress, and disgust; and within the next few months these primary emotions differentiate into joy, anger, surprise, sadness and fear. Self-conscious emotions like empathy, jealously, shame, guilt and pride come later-some of them not until the second year (Papalia and Old 1994).

IV.5.1: General Trends in Emotional Development

Watson (1959) was a pioneer in initiating an experimental approach of the study of emotional responses of infants. He presented various kinds of stimuli to neonates and recorded their reactions. His observation showed that new-born exhibited three kinds of unlearnt emotional responses, namely, fear, rage and love. He postulated
that all emotional reactions experienced by older children and adults are the auto
growths of these three primary emotions.

Bridges (1930) work is classic in the study of emotions. She has made
extensive studies on babies ranging in age from birth to two years in a foundling
home. She noted that the new born responds with an undifferentiated excitement to
any kind of emotional situation. As a result of maturation and learning, differentiation
from the general excitement takes place by about 3 months of age. Distress and delight
are the emotions to appear first. Distress becomes differentiated into anger, disgust
and fear by the time the infant reaches 6 months of age. Jealousy appears from distress
by about 18 months of age and at this age affection is shown for children and adults
separately. Between the ages of 18 and 24 months, the emotion joy, becomes
differentiated from elation and affection on the sight of delight.

Irwin and Weiss (1934) studied the avert activity and incidence of crying
among 50 new born infants when they are clothed and unclothed. They found that
94% of the infants were quieter when wearing clothing. These and similar findings
have been rationalized by Dennis (1940) on the following grounds. Restlessness and
crying can be elicited from the newborn infant by any intense and enduring from of
stimulation. Mild forms of restraint, such as is often induced by infant binding among
certain racial groups may lead to quiescence and sleep. This negative reaction to
intense forms of restraint may generalize to other less physical forms of frustration
with increasing age. However, these later responses to frustration are not necessarily
accompanied by involvement of the autonomic nervous system.

As a result of his investigation, Sherman (1928), proposed a genetic theory of
emotional development. He concluded that emotional behaviour in the newborn infant
is not differentiated beyond the simple feelings of “pleasant” and “unpleasant”. The
infant makes a positive approach response to “pleasant” stimulation, and a negative
withdrawal response to “unpleasant” or noxious situation. With increasing maturation and experience the infant learns to make those responses that are most likely to attract and retain pleasant situations, and to avoid or resist unpleasant circumstances. Thus we see that Sherman’s theory starts with two primary emotional states and accounts for the addition of other emotions on the basis of learning principles.

IV.5.2: Responding to Emotions

From an early age, infants respond to differences in other people’s emotional expressions if these are reflected in direct interaction with the infant. In one study, researchers tested the responses of 3-month-old babies to the emotional expression of their mothers while interacting with the infants (Cohn and Tronick, 1983). Some mothers were asked to act as they normally would, some to act depressed— to slow their speech, keep their face still and minimize touching their infant or moving their own body. The babies responded quite differently to normal and depressed mothers. Babies of depressed mothers spent half the time protesting, reacting warily, or giving fleeting smiles. Babies of normal acting mothers showed much more variety in their play, protested or acted wary only rarely, and when they smiled, did so for significant periods of time.

Young infants also respond to others emotional expressions if the expressions are clear and salient—like crying. Investigators have observed, for example, that 6-month-olds are responsive to the distress of other babies (Hay et al 1981). When infants were placed in a room with another infant who began to cry, nearly all of them (84%) looked at the distressed infant for nearly the whole time he or she cried. Some infants also learned, gestured or touched the crying baby. Moreover, if there were no toys present and the infant went on crying, the other infant was likely to grow distressed too. Clearly infants respond to crying. Some researchers have reported that 3 month-olds who saw a frowning face cried more than infants who saw a smiling face (Barrera and Maurer 1979). Many studies show that a Caregivers emotional expression
(happy, angry, or fearful) influences whether a 1 year-old will show wariness of strangers, play with an unfamiliar toy, or cross the deep side of the visual cliff (Rosen et al 1992; Walden and Organ 1988).

Mothers and fathers serve as equally effective sources of emotional information for babies. When parents are absent, infants and toddlers turn to other familiar adults, especially those who interact with them in an emotionally expressive way (Camras and Sachs 1991). In fact, a Caregivers emotional cues during moments of uncertainty may be a major reason that she serves as a secure base for exploration. In an unfamiliar playroom, babies show a strong desire to remain within eyeshot of their mother. If she turns away they will leave an attractive set of toys to relocate within her usual field so they can retain access to her facial and vocal cues (Carr et al 1975).

IV.5.3: Milestones of Emotional Development During 1st 2 years of life

<table>
<thead>
<tr>
<th>Age</th>
<th>Emotional Expressiveness</th>
<th>Emotional Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth-6 months</td>
<td>Signs of almost all basic emotions are present, each of which becomes recognizable with age</td>
<td>Resonance to the emotional cues of others is present</td>
</tr>
<tr>
<td></td>
<td>Social smile emerges.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laughter appears.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expressions of happiness are greater when interacting with familiar people.</td>
<td></td>
</tr>
<tr>
<td>7-12 months</td>
<td>Anger and Fear increase</td>
<td>Ability to detect the meaning of others emotional signals emerges.</td>
</tr>
<tr>
<td></td>
<td>Use of caregiver as a secure base emerges.</td>
<td>Social referencing develops.</td>
</tr>
<tr>
<td></td>
<td>Emotional self-regulation improves as crawling and walking permit approach and retreat from stimulation</td>
<td></td>
</tr>
<tr>
<td>1-2 years</td>
<td>Self-conscious emotions appear but depend on the presence of others</td>
<td>Vocabulary of words for talking about feelings expand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empathic responding appears.</td>
</tr>
</tbody>
</table>

Note: These milestones represent overall age trends. Individual differences exist in the persons age at which each milestone is attained (Herk 1994).
Following are some of the emotions which develop during infancy.

**Love**

In the first few months, babies do not know that they depend on others to meet their needs. They do get hungry, wet, soiled and lonely, and they cry. After their needs are met, they feel clean and comforted. But it takes time for babies to know that other people are meeting these needs. As babies come to know who helps them, they feel close (attached) to them. In this way, love begins around 6 months of age. Not only do babies show love to important adults, but to children who keep them company as well (Decker 1988). Love between a child and his mother is not only due to her being a source of food but also due to her being a source of bodily contact e.g. Playing in her lap, sucking her breast, sleeping with her. In the development of affectionate relationship the sense of bodily contact appears to take a special significance (Kumar 1988).

**Fear**

At birth, babies startle (Jerk or show the Moro reflex) when they hear loud sounds or do not have support for their bodies. By 4 or 5 months, babies begin to look soberly at strange adults. They may even show fear of known adults in new hairdos, hats, or sunglasses. Babies do not seem to fear strange young children or unknown adults who have their backs to them. Babies seem to fear only the strange adults face or a change in a known adults face. Fear as an emotion occurs around 6 months. Some babies are more fearful than others. Fear affects motor and mental growth because fearful babies often will not try new things (Decker 1988). Emotional reaction of the fear can be most devastating and may promote the development of unhealthy personality (Kumar 1988).
Anxiety

Anxiety is closely related to fear. It is fear of a possible event. Anxiety is seen most often between the tenth and twelfth month. Anxiety shown by young babies is called separation anxiety. Babies become anxious when those adults whom they love leave them. Separation anxiety can be seen when the parent leaves an almost one-year-old baby with a regular baby-sitter. Most two-year-olds do not show as much separation anxiety as younger babies do (Decker 1988).

Anger

Almost from birth, babies seem to be angry at times. Very young babies flail (swing arms and legs in a thrashing motion), turn red, and cry loudly. These actions are like those used to throw a tantrum. Anger becomes more directed toward a certain person or object by 8-10 months. Babies express anger in physical ways. They may try to get away from a person holding them, or they may grab, shake or hit an object. Babies vary in their amount and strength of anger (Decker 1988).

IV.5.4: Influence of Environment on Emotional Development

Environment has a decisive role in shaping the destiny of the child. The parents especially mother contributes maximally to the emotional development of a child. Some of the influences of parental environment are given in the following paragraphs (Ghai 1980).

Parental Rejection

If birth of a child coincides with a tragedy in the family (e.g. death of a family member, loss of employment or financial loss to the parent) it may be considered as a bad omen and may result in rejection of the child. Birth of an unwanted child, or a child of female sex can lead to rejection.
Parental Dominance

The parents try to impose their own value system, aspirations and philosophy on the child. This may build up stresses in the child's interaction with parent.

Overprotected Child

Overprotection may prevent the child to develop his sense of independence and autonomy. The child resists such interference in his or her life. Such over solicitous parents feel frustrated at the attitude of overprotected child.

Over-expectations

They may try to push him to achieve scholastic goals, which may be beyond his level of competence. A conflict between the child's parents expectations increases the stressful situation (Kagan and Moss 1962).

Undue Criticism

Children are very sensitive to implied criticism or comparisons with other children. Appreciation and recognition of the achievement, of your own child is necessary. If parents ignore him and appreciate other children he begins to resent the parental attitude resulting in maladjustment.

Lack of Consistency

Some parents are strict at one time but become lax in attitude at another time. The child is confused. A consistent discipline is conductive to a balanced development (Herington 1975).

Broken Home

A broken home due to parental discord, disharmony or separation is tragic for the development of the child.
Another Birth-Too Soon

The child’s emotional need of affection and security may appear to be threatened with the birth of another child. The older sibling may feel deprived and this may initiate behavioural disturbances (Kumar 1988).

IV.6: Cognitive Development

Cognition refers to the inner processes and products of the mind that lead to knowing. It includes all mental activity-remembering, symbolizing, categorizing, problem solving, creating, fantasizing and even dreaming (Havell 1985). Cognition gives meaning to perceptions. Thus, perception is important to cognition (Berk 1994).

Jean Piaget, the Swiss psychologist, described how humans learn. He believed people learn by exploring their world. Because of inborn reflexes such as sucking and grasping, people begin to explore the world from birth. As reflexes disappear, voluntary movement and sense perception help infants explore (Decker, 1988). As a cognitive theorist Piaget has embraced the concept of development in stages that are sequential, irreversible and qualitatively different.

IV.6.1: Divisions Of Development

Piaget’s four major divisions of development are:

- Sensori motor
- Pre operational
- Concrete operational, and
- Formal operational.

Sensorimotor (Birth to 2 years)

The sensorimotor period is composed of six fairly discrete stages encompassing the first 18 months of life.
• Practicing Reflexes (Birth - 1 month) This stage is primarily devoted to exceeding the ready-made reflexive schemata such as sucking, crying and making fists.

• Repeating New Learning (1 - 4 months) Babies begin to change some of their reflex skills. Before babies sucked and grasped only when stimulated. In this stage, babies do such things as suck their thumbs or open and close their hands. These actions are not planned, but they bring pleasure. Babies repeat the actions often. Piaget called the main learning in this stage primary circular reactions. Towards the end of this stage, babies are anticipating the future. In this way, routines help mental growth.

• Beginning to control their World (4 - 8 months) : The numbers and types of actions increase at a rapid rate throughout this sub-stage. Many new actions - such as kicking - do not have their roots in the reflexes. These new actions aid infants as they explore their world. Piaget called these learning secondary circular reactions. During this time, infants also begin looking for objects. This means that they realize objects exist even when they can't see them.

• Applying Learning to Solve Complex Problems (8 - 12 months): In this sub stage, babies begin to apply learning to solve complex problems. They try to discover an object's purpose. They examine an object and then experiment with it. During this stage babies combine two or more actions to achieve a goal. Combining actions helps the baby to achieve many more goals than would be possible if a new action had to be learned for each goal.

• Discovering New Ways to Solve Problems (12 - 18 months): This is characterized by tertiary circular reactions. The child is busy exploring and manipulating different means to the same end, or investigating one particular activity for a variety of results.
• **Beginning of Thought (18 months - 2 years):** In this stage child invents new means unlike any she has tried previously. For example, without any prior experience, she figures out how to open a box (Decker 1988).

**Pre operational Stage (2 - 7 years)**

The highlights of this stage are the new use of symbols, symbolic play and language. Symbols and symbolic play are qualitatively new because they mark the child’s ability to think about something that is not immediately before him. Previously, intelligence was limited to the child’s immediate environment. This development gives the mind greater flexibility.

The intuitive or transitional stage begins roughly at 5 years of age. A child is able to understand multiple points of view and relational concepts than the pre conceptual child. Still, his thought is characterized more by what he does not know than by what he does know. His comprehension of arrangements by size, number and spatial classifications is incomplete. He is unable to perform mental operations or transformations of perceptual reality (Craig 1979).

**The Concrete Operational Stage 7-11 years**

Piaget viewed the concrete operational stage, which spans the years from 7 to 11, as a major turning point in cognitive development. When children attain it, their thought more closely resembles that of adults than that of the sensorimotor and pre operational child. According to Piaget, concrete operational reasoning is far more logical, flexible and organized than cognition was during the preschool period (Berk 1994). A child is increasingly able to think about things from points of view other than his own, although these thoughts do not rise to the level of abstractions. He can perform some operations on specific events or objects, but he cannot operate on his own operations (Phillips 1979; Inhelder and Piaget 1958).
**Formal Operations (11 years and older)**

According to Piaget, the capacity for abstract thinking begins around age 11. At the formal operational stage, the adolescent reasons much like a scientist searching for solutions in the laboratory. Concrete operational children can only operate on reality, but formal operational adolescents can operate on operations. In other words, concrete things and events are no longer required as objects of thought. Instead, adolescents can come up with new, more general logical rules through internal reflection (Berk 1994). Formal operations concludes the most dramatic developments in cognition, although other forms of growth continue throughout adulthood (Craig 1979).

**IV.6.2: Infant Cognitive Development**

Bower (1976) tested babies on the Piagetian concept of conservation, which can be briefly summed up as the awareness that matter does not change in quantity if it is rearranged. A ball of clay, for example, that is then rolled into the shape of a sausage still contains the same amount of clay and weighs the same.

Piaget and most other researchers have found that children do not grasp this concept until about 9 years of age. Bower, however, found that 18 month old babies move their arms in picking up the two different shapes of clay in such a way that shows that they know the weight remains the same. When he tested the same children two years later, however, he found that they no longer acted as if they understood this principle. They seemed to reacquire it at the age of 7 or 8, lose it again, and not have a stable grasp of it until they turn 13 or 14 years old.

Bower also found evidence of other concepts at an early age, such as object permanence and number conservation (when objects are rearranged into different patterns, the number of items remains constant). Postulating that children lose these
concepts because they don’t practice them, Bower provided practice — and got some unexpected results.

Children who had attained number conservation before the age of 2 and then practiced the counting tasks did more poorly at the age of two or two and a half than children without practice. By the age of 5, though, the practiced group had caught up.

In referring to a similar situation with children who had received practice in a task relating to object permanence, Bower suggested that too much practice on one task might promote acquisition of a concept so specific that the children cannot apply their discoveries to other similar situations. They lose the relationship between the initial problem and the new one. Says Bower, they must dredge the initial discovery from their memory, erring until they do, and they will seem to repeat an earlier phase of their cognitive development.

Phatak et al. (1990) conducted a study to find the pattern of cognitive development of normal babies from birth to six weeks. They observed that Indian baby at six weeks is still a baby in arms in need of support, getting acquainted with the environment through vision and passive body movement. The following aspects of mental development have been credited with 100 per cent beyond a particular age and give a trend.

- Quiet when picked up – 7 days
- Momentary regard of red ring – 14 days
- Responds to sounds of bell facial expression – 14 days
- Responds to sound of rattle facial expression – 14 days
- Regards a person up to 5 seconds – 21 days
- Free inspection – 21 days

The cognitive development of children from one month to 30 months was undertaken by Phatak (1969, 1970). It was observed that during 1st month all infants...
can regard a person momentarily and respond to voice. During 2nd month they can follow up moving person, vocalize once or twice. In the 3rd month children show social smile. In 4th month infants search for sound with eyes, recognize the mother. In 6th month approaches mirror image plays with paper and inspects own hand. In 7th month pick one cube, lifts cup, discriminate strangers, reaches for second cube and retains 2 cubes. In 8th month smiles at mirror image. In 9th month retains 2 or 3 cubes offered. 10th month infant can realize 4 different syllables. In 12th month adjust towards and says da - da.

In 15th month he can uncover a square box, turn pages. In 18th month he can adjust the round block in the hole of the form board. In 19th month can say 2 word by 23rd month he can build a tower of 3 cubes. By 25th month he can point to parts of doll and use words to make wants known. In 26th month he can name one object and discriminate between a cup and a plate: By 30th month he can make a train of cubes and form sentences with two words.

IV.6.3: Cognitive Stimulation

The role of cognitive stimulation has been considered very significant in the context of researches in the area of deprivation and social advantage. In these attempts the major emphasis has been on establishing the link ages between the level of stimulation and cognitive attainment. The findings in general suggest a negative relationship between deprivation condition and cognitive development. It has been observed that experiential deprivation associated with residential background, caste status, ethnic differences and poverty have retarding effect on cognitive competence, intelective performance and scholastic achievement. (Mishra 1983; Sinha 1982; Tripathi 1988). The impact of deprivation is complicated by the non-intelective factors like malnutrition, motivational inadequacy and lack of supportive climate. On the whole, the available evidence tends to suggest that the children from deprived
backgrounds display a cluster of features which renders them ill-prepared to participate in the main stream. The negative effects of deprivation are of cumulative nature and, therefore, the discrepancy in performance between deprived and non-deprived groups increases with age and grade. This situation demands early and sustained intervention so that the vicious circle of poverty and deprivation may be broken. This kind of intervention needs structural change as well as psychological enrichment.

In recent years some attempts have been made to enrich the lives of these deprived children through various programs of cognitive stimulation. For instance Dash and Rath (1984) have tested a short, term 8 week cognitive stimulation program on other cognitive test performance. The pretest-posttest design showed that the performance on visual perception and association and figure drawing improved significantly and the improvement was greater in the disadvantaged group.

Rath and Patnaik (1979) found cognitive training effects on verbal reasoning test performance, conservation for volume also increased. Positive transfer was found. Sinha and Mishra (1985) showed that helplessness has greater effect on cognitive performance of highly deprived. Mohanty and Choudhary (1981) demonstrated the effect of training with screening and self-transformation was effective in inducing conservation among non-conserve children between 5 and 7 years of age. Anandlakshmy (1990) has reported an interesting study of intervention into cognitive development through playing with infants between 9 - 15 months. While one month of play sessions appeared insufficient to cause any appreciable increase in the developmental indices of infants; nevertheless, their motivation to play increased. The intervention was successful in providing the needed experience which resulted in exploratory orientation. The studies on environmental process/variables related to cognitive development (Anandlakshmy 1990, Bevli 1990, Mishra and Tiwari 1990)
indicate that mothers education regarding the significance of play activities, teaching practices, ethical discrimination, parental attitudes, emphasis on positive concepts, parental concern, climate of home significantly contribute to cognitive outcomes. Preschool experience has also been reported to be an important factor influencing cognitive development, the effect of which is equally shared by high as well low SES children (Jachuck and Chatterjee 1989). Recently D.Sinha (1990) has analyzed the issue of intervention in the context of poverty and deprivation. He notes that psychology has limited but significant role in coping with diverse problems by helping the poor and deprived in developing adequate coping strategies skill, attitude and motivation. This, however, should be backed up by relevant environmental support.

V: Development Assessment

Development assessment serves different purposes at different ages. In the neonatal period, behavioral assessment can detect a range of neurological impairments and can sensitize parents to their infants individual characteristics. During infancy, assessment serves to reassure parents and to identify sensory, motor, cognitive and emotional problems early, when they may be most amenable to treatment. During middle childhood, assessment may suggest solutions for academic and social problems. Assessment includes both screening and diagnosis. Screening identifies children who may benefit from further diagnostic assessment; developmental diagnosis involves identifying a specific delay or disability and understanding its significance in the context of the child’s other biological psychological and social strengths and vulnerabilities (Nelson 1996).

Assessment during infancy is based on the importance of early intervention for developmental and emotional problems. Developmental assessment is extremely
important to know about the child’s previous development and to compare it with future development (Illingworth 1991).

According to Good enough, Tiedemann in Germany (1789) was the first to publish a detailed record of the development of one child, but it was not until Charles Darwin in 1877 published a detailed account of the development of one of his own 10 children that interest aroused. In 1893 Shinn published one of the most complete records of a young baby’s development. In 1931 Shirley wrote an extremely full account of 25 children in their first 2 years (Illingworth 1987).

VI: The Value of Development Assessment

Every parent wants to know whether his child is developing normally, especially if in a previous pregnancy there had been a miscarriage or still birth, or if the child had proved to be mentally or physically handicapped. An elderly mother, with no other children, who has lost her husband or is separated from him, is likely to be unduly concerned about her child’s development.

Developmental assessments provide important information to the obstetrician with regard to the safety of special investigations, treatment and management in pregnancy or labour. It provides vital information for the neonatologist, who has to face difficult ethical problems with regard to the resuscitation of very low birth weight babies or of the infant thought to have suffered serious perinatal brain damage. The pediatrician needs to be able to assess a baby’s mental development when faced with sucking and swallowing problems in the newborn, backwardness in any field of development, or with a child of unusual appearance or behaviour. By his full developmental examination he is able to make an early diagnosis of defects of vision or hearing. In order to make a decision about suitability for adoption, developmental assessment is essential. Developmental assessment is frequently of great importance
for medico-legal purposes. Numerous claims are made against doctors or hospitals, on the grounds that child’s mental or physical handicap was caused by brain damage arising from negligence when he is found to be mentally subnormal or to have cerebral palsy; a plaintiff may blame the obstetrician for causing at delivery or labour (Illingworth 1987).

VII: Methods of Assessment

For a long time the clinicians have been using the age of achieving certain skills as a quick but crude index of the child’s development. Such age-bound indices are called milestones (indicating the progress on the life-road). One cannot rely on a single item for assessing the development of a child especially if the deviation from normal is not gross. For careful assessment and follow-up, a battery of tests must be employed so as to cover the development of intermediate steps and allied skills (Nelson 1996).

A large number of methods have been standardized to assess the development of children. They demand the availability of skilled clinical psychologist and specialized kits for reliable assessment. Gesell development evaluates gross motor, fine motor, social, adaptive and language behaviour. Amiel-Tison method of assessment pays special attention to muscle tone (active and passive), neurosensory responses (Visual and passive) and neurosensory responses (Visual and acoustic) and neurobehavioural assessment. Vineland and Ravals social maturity scale assesses the social and adaptive mental development. The other methods of neuromotor assessment include Bayley scale of infant development (motor and mental), Brazelton neonatal behaviour scale, Voja Technique (postural reactions and central coordination) and Denver developmental screening test (DDST). Among these, Bayley
scales of infant development (BSID), is most popular and widely practiced. In the community setting health workers can be trained to screen development of children by using Phatak's Baroda Screening Test, Baroda Developmental Screening Test (BDST), Trivandrum Developmental Screening Chart (TDSC) and Woodside Screening system Tests (WSST) (Singh 1996).

Gesell's Development Schedules

Gesell has devised two schedules - Developmental Schedules for the age group from birth to 18 months (Gessel 1969) and Development Schedules for 15 months to 72 months (Gesell, 1963). With these schedules it is possible to assess development in four areas (i) Motor, (ii) Adaptive (iii) Language and (iv) personal-social. The results are expressed in terms of development quotient (DQ). The schedules are useful for developmental diagnosis – the discrepancies in the 4 areas of development – indicate the diagnosis e.g. brain damage, lack of environmental stimulation etc. Even though attempts have been made to standardize the schedules for Indian children, no suitable norms are available (Nelson 1996).

The Bayley Scales of Infant Development (BSID)

The scales measure the development of an infant (up to the age of 30 months). Under 2 headings - the motor and the mental. The motor scales have 67 test-items and the mental scale have 163. In the motor as well as the mental scales, all the items are arranged in order of difficulty or to put in other words, in the order of increasing age placement. Each item that the child passes is given one mark. The total motor and mental performance scores are counted by adding the number of items passed on the respective scales. The age-placement of the item whose serial number corresponds to the total score gives the development age of the child (Nelson 1996).
**Denver Developmental Screening Test**

It was first developed in 1967. It was devised to provide a simple method of screening for evidences of slow development in infants and preschool children. The test covers four functions. Gross motor, language, fine motor-adaptive and personal-social (franken burg and Dodd 1967). DDST was subsequently revised, re-standardized and presented as the Denver II Test in January, 1992. It contains 125 items. It surveys a broad range of developmental skill which are presented as age norms, just like physical growth curves. Developers of the Denver II emphasize that the module does not quantitatively measure intelligence, motor development, communication skill or social competence. This is not a substitute for appraisal of intelligence or developmental quotients.

A child's development is considered delayed if the child cannot perform an item which 90 percent children of his age can do. Caution is advocated if the child is delayed in 2 or more items which can be done by 90 per cent of children of comparable age. Three or more cautions are considered suspect (Ghai 1993).

**Trivandrum Developmental Screening Chart**

The Trivandrum Developmental Screening Chart (TDSC) was designed and developed at the child development center, SAT Hospital, Medical College, Trivandrum. 17 test items were chosen to include adequate mental and motor developmental milestones spread over the first two years of life. The range for each test item was taken from the norms given in Bayley Scales of Infant Development (Baroda norms) It was validated both at the hospital and community level against the standard DDST. TDSC had a sensitivity of 66.7% and specificity of 78.8% which makes it an acceptable simple screening tool even for the community level worker (Nair et al 1991). It is suitable for developmental screening of children below 2 years of age.
Woodside Scale Development

The woodside system uses 4 charts for graphic representation of the developmental progress of the child. These charts refer to (1) Social (ii) hearing and language (iii) vision and fine motor, and (iv) Gross motor areas of development. Development is considered satisfactory if the mark on the woodside chart lies above the step. It is doubtful if the mark lies between the step and the dotted (threshold) line or the mark lies on the bottom step for the child whose age falls between two consecutive steps (Ghali 1993).

Baroda Development Screening Test (BDST)

To simplify the Bayley scales of infant development, 22 motor items and 31 mental items not requiring any standardized equipment have been retained. These items were grouped age wise, one monthly in the first 12 months and 3 monthly thereafter till 30 months. The 50 percent and 97 percent age placement of each item have been plotted on a graph and joined to have two smooth curves. The total number of the items passed by a child is plotted against his chronological age. When this point falls below 97 percentile curve, the child is considered to have developmental delay and is subjected to detailed assessment (Singh 1996).

A screening tool for Assessment of the Home Environment and Psychosocial Development of Preschool children has been developed by Uma et al (1962). This tool was developed on the basis of the data collected on a sample of 150 children in the age range of 2 years 10 months to 3 years 8 months. (O-relation analysis was used in identifying home environment and psychosocial development variables for the development of the tool.

A multi centric cross-sectional collaborative study was undertaken in 3 centres in India with the main aim of developing simple and reliable indicators for the early
detection of developmental disabilities in children under 6 years of age and to compare the age of attainment of developmental milestones in children in the 3 regions. The study provided a simple low-cost and culture-appropriate psychosocial developmental screening test battery which can be used with ease by trained public health grass-roots functionaries (Vazir et al 1998a).

Culturally appropriate techniques for monitoring child psychosocial development were prepared and tested in China, India and Thailand on a total of 28,139 children. Representative groups aged between birth and 6 years were examined and the results were used to produce national development standards separately for rural and urban children in China and India, and for all children combined in Thailand. In each country, between 13 and 19 key milestones of psychosocial development were selected for a simplified developmental screening operation and these have been incorporated on a home-based record of a child’s growth and development (Lansdown et al 1996).

A culture-appropriate and simple test battery consisting of 67 test items was developed and field tested in Haryana, India in 1987-89. Percentile age values were constructed for various developmental milestones included in the cultural-appropriate test battery. The locally relevant, simple and low cost developmental tests and reference values can be used for early detection of developmental disabilities at primary care level (Kumar et al 1995).

**VIII: Common Pitfalls of Development Screening**

When considering the range of developmental problems in children, there are several common pitfalls into which an untrained practitioner is likely to fall. Before using any screening clinicians must be aware of both the strengths and weaknesses of screening (Malhi and Singh 1999).
The most common pitfall revolves around the notion that children who are mentally retarded, also look different (Illingworth 1987). Evidence indicates that the good looking delayed child is typically identified late conversely, the child with dimorphic features may (Lock et al 1986) not be necessarily intellectually deficient (Blasco 1991).

Another pitfall of developmental diagnosis which practitioners often fall prey to is when a child with normal or near normal gross motor development is presumed to be of normal intelligence. Several authors have emphasized that motor milestones are not predictive of intelligence. Studies reveal that many children with moderate and severe mental retardation do not demonstrate gross motor delay (Malhi and Singh 1999).

In addition, there is tendency among practitioners to ignore language delay until about 2 years. It is important to remember that language development, which is measured in terms of expressive and receptive capability, is one of the best predictors of later intelligence, and no parent with a child with language delay should be reassured without appropriate developmental testing (Malhi and Singh 1999).

One of the most serious pitfalls is when the results of development screening tests are used for predicting later developmental status or intelligence of the child. In the first two years of life, scores on development tests have limited predictive value for future development unless the scores are in the very retorted rang. Predictions improve as the child grows older but are still subject to serious error because a child may undergo at least two types of changes in development after the administration of an early screening test. One change in the developmental status of the child as he grows older is due to the acquisition of new skills which are qualitatively different from earlier skills. Developmental testing at different ages means different skills are
the focus of testing while in infancy, developmental testing is confined to testing of sensory motor skills, at older ages screening necessarily involves testing of higher mental abilities (Malhi and Singh 1999).

The second problem relates to the change in the child's circumstances, both physically as well as psychosocial over a period of time thus altering a child's rate of development. Environmental factors and psychosocial stresses such as death of a parent, may also delay development. Keeping this in view, it is recommended that no screening result should be used in isolation to make a definite statement of diagnosis. Moreover, a child who fails on a screening test should be periodically screened before making a definitive diagnosis. In order to ensure accuracy it is recommended that only trained persons administer a screening test (Malhi and Singh 1999).

IX. Present Trends and Future Perspectives In Child Development

There has been upsurge of interest in the area of developmental psychology recently. In the last decade, it has shown the happy trend of extending its scope and broadening its horizons across various aspects of human development. It focuses on changes in behaviour and various abilities accursed as the child grows up as well as on the process of change. The present trend is towards an increasing sense of social relevance and ecologically valid theorizing (Bevli 1990).

At the very outset, however, it may be noted that while the trends do suggest patterns of development in diverse areas the available studies have several limitations. The studies are usually based on data form limited samples which do not represent Indian children in any statistical sense. The limited coverage of data is largely because of lack of any network of developmental research as well as increasing specialization in our attempts to understand various aspects of child development independently (Srivastava 1998).
The research usually use western scales adopted to the Indian situation. This type of trend is a very common one showing the influence of western research methodology on Indian social scientist. These researches fulfill one basic need, that of giving some type of much needed developmental norms or patterns for Indian children. These researches can serve as the basis for further developmental research as well as the development of tools specifically for the needs of our population in India.

Deprivation is one of the major concerns of the researches in India and is woven in research designs in one form or the other. It may be studied as urban-rural, higher caste-lower caste or S.E.S differences. Another favourite field for research is that of cognitive development based on the piagetian model. In India as elsewhere in the world, most of the studies have been replications of conservation studies at the concrete operational level. Some correlation and intervention studies have also been attempted recently.

Despite the awareness among scholars that the trend in growth and development, individual difference in patterns of development and definitive antecedent consequential relationships can be best studied through the use of longitudinal designs. The research should proceed in a systematic manner through a coordinated series of researchers focussing on specified problems areas of social relevance. Hence, more field studies may be able to deal with the problem and provide solutions to the policy makers.

Finally it can be said that a fast changing society demands an increase in the adaptive capacity of an individual and development of dispositions favourable to change. This can be viewed as a consequence of change, can be actively developed to facilitate change and self-reliance. In terms of future perspective, as much attention needs to be paid to development of theory and empirical research on fundamental processes, as in responding to social pressures to seek solutions to social problems (Bevli 1990).
Development Studies

I: Standard Test

Hemgren and Persson (1999) presented a new model for combined assessment of motor performance and behaviour (CAMPB) in 3 year old children. It is intended for simultaneous use with a scale for assessment of motor-perceptual development. The child’s performance is observed and compared with detailed descriptions of performance in gross and fine motor functions, and descriptions of coordination, attention and social behaviour, included in a protocol. An overall evaluation is also made. These assessments have been performed in a longitudinal follow-up study of children. It was observed that CAMPB together with the motor perceptual scale was feasible in these 3 year old children and CAMPB was sensitive enough to detect differences between children.

Dorthy and Brown (1984) conducted a study to provide a standardized test procedure to assess some areas of development in children between 18 months to four and a half years of age. The study shows the importance of the 27-33 months period in the development of situational understanding. Young children develop along a number of pathways simultaneously, i.e., language, performance, vision, hearing and motor function. The Bus Puzzle tests developing language skills and some performance skills. It gives some insight into visual and hearing behaviour although not measuring visual or hearing acuity. The Bus Puzzle Test has been designed to explore developing language skills and performance skills.

Culturally appropriate techniques for monitoring child psychosocial development were prepared and tested in China, India and Thailand on a total of 28,139 children Representative groups aged between birth and 6 years were examined and the results were used to produce national development standards-separately for
rural and urban children in China and India, and for all children combined in Thailand - which are considered to be more satisfactory than foreign based standards. In each country, between 13 and 19 key milestones of psychosocial development were selected for a simplified developmental screening operation and these have been incorporated on a home-based record of a child's growth and development (Landsdown et al 1996).

A multi centric cross sectional collaborative study was undertaken in 3 centres in India with the main aim of developing simple and reliable indicators for the early detection of developmental disabilities in children under 6 years of age and to compare the age of attainment of developmental milestones in children in the three regions. The study provided a simple low-cost and culture-appropriate psychosocial developmental screening test battery which can be used with ease by trained public health grass-roots functionaries. This instrument was standardized on a large rural, tribal and urban sample comprising more than 13000 children from 3 regions in India. The procedure for sampling, selection of items and methodology for standardization of the instrument in the Hyderabad region detailed in this paper were replicated in other centres as well. Quality control of data was ensured through inter-rater and test-retest measures of reliability. During pre-testing, 66 culture-appropriate milestones were selected finally from a larger item pool. The 50th percentile age reference values of the Hyderabad study children and those obtained by other 2 centres were comparable (Vazir et al 1994 a).

A screening test for the assessment of the motor-mental development of infants was developed by selecting items from the Bayley Scales of Infant Development (BSID). Borado norms as a simple and quick test for use in the door to door survey by health workers. The reason for choosing BSID and the criteria for the selection of items are described. The method of using the screening test in community surveys and
in office practice is discussed. Some aspects of the development of our screening test and the Denver Development Screening Test (DDST) are compared. A routine use of our test is recommended for following the development of normal children as well as for screening from community children with possibility of development delay. The later must be referred for detailed testing on the full scales (Phatak and Khurana 1990).

The Trivandrum Development Screening Chart (TDSC) was designed by selecting 17 test items from BSID (Baroda Norms). It was validated both at the hospital and community level against the standard DDST. TDSC had a sensitivity of 66.7% and specificity of 78.8%; which makes it an acceptable simple screening tool even for the community level worker (Nair et al 1991).

A culture appropriate and simple test battery consisting of 67 test items was developed and field tested in Haryana, India in 1987-89. Trained field workers administered the tests to 3731 pre-school children in 47 randomly related villages of a district, irrespective of their physical/mental status. Percentile age values were constructed for various developmental milestones included in the cultural appropriate test battery. The locally relevant, simple and low cost developmental tests and reference values will be used for early detection of developmental disabilities at primary care level (Kumar et al 1995).

Dixit and Patel (1994) in their study on Psychosocial development of urban children reveal that using Shakir’s classification the children did not suffer from any malnutrition. Analysis of data revealed “at par” performances in Gross Motor, Hearing and Self Help Skills and delays in vision and Fine Motor, Language and Concept Skills. Social skills were particularly advanced. For developmental assessment, the WHO suggested culture appropriate Psychosocial Basic Test Battery was used.
Six hundred and nineteen infants and young children from the slums of Jabalpur were screened by twenty trained paramedical workers using the Woodside Screening Technique. A second screen was given by the author within three days of the 1st screen on 350 (56.6%) children. The tester/author agreement was 97%. The results of the woodside screening Technique were validated against the Standard Gesell’s Schedules. The specificity and sensitivity rates of 88 and 83% respectively were better than the original Denver Developmental Screening Test (77% each). Over referral rates which vary between 10-28% were comparable to the original Denver Developmental Screening Test. The under referral rate was 24%. All children tested belonged to the deprived sections of society, having weights below 50th percentile of Harvard Standards. In spite of this 74% of children scored above and at par on the Gesell’s developmental Schedule. Only 11% children showed developmental abnormality (Gupta and Patel 1991).

Phatak (1984 a) conducted a study on motor and mental development of normal babies. 150 full term normal babies were administered 11 motor and 19 mental tests based on Bayley Scales of Infant Development (BSID) in the neonatal period. Results of age placements are compared to extrapolated results as reported in “Baroda norms”. 5 motor and 6 mental tests from above were passed by 100% of sample babies of specified ages and are hence listed as possible indicators failure on which could be regarded as need for follow-up studies of development. A pen picture of the abilities of the Indian baby aged 6 weeks compares well with its reported British counter part.

Phatak et al (1984) analysed records of 3 to 10 longitudinal development testing in each of 21 babies (1 full term normal, and 20 premature and other high risk babies) with a view to establish the validity of 11 pre selected indicators of
development in the neonatal period. 4 motor and 3 mental items were noted as valid or promising based on persistence of delayed performance patterns in 60% of the sample. The use of these tests as quick developmental tests in neonatal wards and well baby clinics is recommended.

Gaussen (1984) has stated that there is a wide gap between recent research models of infant development and available clinical procedures. He has reported that there are limitations of current assessment instruments, with special reference to motor-impaired infants. These limitations are especially important for assessment and intervention strategies with impaired infants (0-30 months). It is suggested that new assessment methods are needed to tap the processes underlying developmental change and more accurately reflect the complexity of factors affecting development.

II: Norms

Uklonskaya, et al (1960) reported their observations about the development of static and psychomotor functions during the first year of life. The physical development of these children was normal. The observations of Indian babies were compared with Russian standard norms of psychomotor development. Results revealed that Indian babies were on par with Russian babies brought up under nursery care up to 7 months and after that their development was retarded. This retardation was explained by referring to the complicated psychomotor functions of crawling, standing with support, toddling and speaking which required special adult attention and training, and to the mother’s lack of such knowledge about training and bringing up babies.

Studies from India and abroad indicate that average or normal children usually lift their head for a short span of time when on stomach by about the first or second month (Frankenburg and Dodd 1967; WHO - ICMR study 1991) and the head is held
steady in sitting position by about the fourth month (Gesell 1971). Sitting without support by children by about six months of age. These observations were made in a study involving more than 13,000 rural, tribal and urban children from three regions in India (WHO-ICMR Study 1991).

Before learning to stand, some children pass through a stage of crawling as a means of locomotion. This is usually achieved by average children around the seventh month while standing without support is achieved by 10-12 months (WHO-ICMR Study, 1991).

Pathak (1970) revealed that the rate of motor and mental growth was fast upto six months, after which the rate decreased and became steady during 12 - 16 months. Sex differences in motor and mental development were observed in babies belonging to upper socio-economic status and urban areas. The urban upper socio-economic group seemed to be performing better than all other groups except on the motor scale for the first six to seven months. The urban environment suggested positive influences on mental performance. The trends of motor and mental growth were similar in Indian and foreign babies on Bayley scales. The validity and reliability of Bayley scales as applied to Indian babies was acceptable.

Muralidharan (1974) reported that urban children are found to be faster in motor development than rural and industrial children. The regional differences remained the same irrespective of the area. A comparison of the present result with Gesell’s Study showed that on the whole, the present sample appeared to be a little more accelerated in development than Gessell’s sample, in most of the motor skills.

Bhandari and Ghosh (1979) in their longitudinal study of Gross Motor Development of children found that in general, male children achieved some of the developmental stages significantly earlier in a number of test item than the female
ones. After using Gessell's norms as the standard it was found that the majority of children were developing normally.

NIN (1984-85) conducted a survey in 23 villages 20-30 Km from Hyderabad on 706 infants to gather information on developmental milestones among rural Indian infants. Data obtained from these studies should that several of the milestones especially neck-holding, crawling, sitting and indication of desire by pointing, occur at an earlier age among these rural infants as compared to the ones reported from developed countries. It is reassuring that rural Indian infants do not suffer from any retardation in developmental milestones.

The attempt made by a child to scribble occurs around 14 to 15 months among average Indian children (WHO-ICMR Study, 1991) compared to about 10 months among American Children (Bayley, 1969). It should be borne in mind, however, that even normal children vary greatly in attainment of specific skills. No child is expected to achieve steps of growth and development at exactly the ages reported in 'normative' studies. The traditional exploration for motor development is based on the process of maturation. That is an infant will acquire the ability to sit, stand, walk, run and grasp biologically, irrespective of whether he/she receives conscious training. A more modern proposition, however, stresses on the importance of the opportunity offered for development of skills and the negative influence that restriction can have on skill acquisition (Lansdown and Walker, 1991).

The development of fine prehension (i.e., the act of grasping) among infants involves the integration of visual and neuro-muscular components. An organization of patterns can be perceived within the progress of behaviours such as those of reaching and grasping. This organised pattern includes the ability of the eye to see and the hand to grasp. Studies in India indicate that infants are able to reach for objects by about 3
or 4 months (WHO-IMCR, 1991; Phatak and Khurana, 1990) and they can grasp an object by about 5 to 6 months. These ages of attainment are comparable with western figures (Bayley, 1969; Franken burg and Dood, 1967; Gessell 1971).

Robson (1984) reported that majority of normal infants crawl on hands and knees as the predominant means of moving from place to place before they get themselves to standing. Others Shuffle in a sitting position, creep on the abdomen or roll and tend to walk much later than the crawlers. The earliest walkers have no observable pre-walking locomotion - They just stand up and walk. In many instances, the age at which one loco motor milestone is attained co-relates well with the age at which subsequent milestones appear, thus permitting prediction of the age of standing and walking.

III: Factors

The earliest work about growth and development during infancy was reported by Venkatachar (1930). On the basis of various comparisons it was revealed that following factors seem to be related to mental retardation, in order of their importance -- weak physical constitution, extremes of poverty and riches, immaturity and inexperience of mothers, lack of suitable companions at home and illiteracy of parents. The performance of these babies was also compared with that of American babies. The Mysore children appeared to be superior to American children in tests of pursuit and manipulative reactions below six months of age.

Certain emotional factors like fear and anxiety may have a negative influence on the child’s attainment of motor skills. Dangerous accidents while jumping or running may produce fear and timidity. Anxiety on the part of parents also may prevent at time child from practicing new and complicated skills because of fear of taking risks. Over-enthusiasm from adults may inhibit a self-conscious child as also a
fear of failure against parental expectations. Often the development of courage or timidity among children occur as byproducts of skill learning in the course of motor development.

Studies on motor development of urban and rural children in India indicate some differences in the age of attainment of motor skills of these children (WHO -ICMR Study, 1991). In a large multi centric cross-sectional study Muralidharan (1971) found that urban children could throw a ball at a greater distance compared to industrial or rural children while industrial children were ahead in kicking the ball to a greater distance. On tasks such as standing, walking and running, urban children were ahead and were able to attain these skills by two and a half to three years of age followed by children from industrial areas who attained them by three to three and a half years of age. Compared to Gesell’s norms, Indian children were found to be ahead on most skills of motor development except ascending and descending the steps and taking a running board jump.

Babies and pre-school children with severe visual disabilities have been studied by Sonksene et al (1984) in a developmentally oriented clinical research setting. Severe congenital visual disability delays and alters development in all areas; the impact on motor development is complex with much secondary to delay in other areas.

The age of learning to walk may be delayed by malnutrition. (Sigman et al, 1989) and occasionally by obesity (Jaffe, 1982). Anything which keeps a child off his feet, whether illness, mismanagement or institutional life will retard walking (Illingworth 1991). The child’s personality has an important bearing on the age at which he walks without help. Familial factors are important in achieving various milestone (Illingworth 1991). Sex does not play any major role during infancy in
activity level regarding motor development. But as the child enter social play age, these differences can be seen. The girls are seen playing passive games as compared to boys who indulge in building etc (Sharma 1995 and Illingworth 1991). Small family size was associated with better motor development by a study conducted by Upadhyay et al (1992).

Apart from differences due to the urban-rural environments, other factors such as debilitating diseases, chronic and repeated infections and a lack of nourishing diet are commonly involved synergistically and can influence motor development. Children from poor illiterate and socio-economically disadvantaged families are especially vulnerable to childhood infectious diseases such as diarrhoea, whooping cough, jaundice, measles, chicken pox etc. These diseases can impair the immune system and thereby produce not only growth retardation but also affect physical strength and motor function in children (Reddy and Vazir et al 1998 b).

Upadhyay et al (1983) conducted a study on mental development and physical growth of 46 pre-school children (2-5 years) of non-goitrous and goitrous mothers. Gesell development schedule was used to assess their developmental quotients (DQ). The anthropometric characteristics of the two groups showed significant difference in means for weight, height and head circumference. However, the mean chest circumference and the triceps skin fold thickness were significantly higher in the children of goitrous mothers.

The DQ in the children of goitrous mother was significantly lower as compared to the non-goitrous group. Further analysis of the developmental pattern for motor, adaptive, language and personal social performance in these groups showed that language development was significantly inferior for the goitrous group. Moreover, all
the developmental scores demonstrated lower mean values with the severity of maternal goitre.

Gilbert et al (1982) suggested that fathers have a significant impact on all aspects of child’s development. But in an extensive review of the literature looking at potential influences on child development, Lamb et al., (1986) concluded that there was no evidence that the father’s role is necessary in any aspect of child development. They suggest that in his absence, development usually proceeds quite normally. They further suggested that the implication of such a conclusion is that although increased parental involvement may increase the magnitude of paternal influence, it does not have effects on children, sufficient to justify a conclusion that increased paternal involvement would be beneficial to all children and their families.

Arya, S. (1980) reported that there are significant differences in maternal activities such as ‘shows affection’, ‘smiles’, talks to infant and pats’, thereby signifying that mothers of well nourished showed more maternal care than those of under-nourished children. The infants of HIBW and LBW differed significantly in their activities such as ‘vocalizes’, ‘cries’, ‘fusses’, ‘burps’ and ‘sucks’. Thus it was observed that there was a correlation between mothering and infant activities and birth weight of infants.

Anandalakshmy (1990) highlights the crucial role played by the mother in optimizing infant development. Clearly one should aim at educating mothers on the value of stimulating play activities and at providing them with skills that would enable them to offer a stimulating environment for their infants.

Antonovsky (1981) has stated that low level of maternal affection prolongs the period of child dependency.
Watson (1959) stated that if it is maternal attitude which most profoundly influence later personality development.

Denise et al (1984) indicated that mothers may facilitate early language development. They concluded that mothers may be an effective teaching language for very young children.

On examining the predictive validity of early mother-infant interaction for development in early childhood, Deborah and Lewis (1984) found that percentage responsivity measures are the best predictors of child performance. The researches found that proximal and vocal responsivity were related to reading and conversation while distal responsivity to infant distress were related to math achievement.

Tiffany and Martin (1984) found that separation from mother during the birth of another child resulted in increase in fantasy play which was interpreted as active coping both with the stress of separation and altered interactions following the arrival of a new sibling. They further found that following the mother’s return, there were decreases in positive affect, activity level, heart rate and active sleep suggestive of depression. These effects were attributed to the arrival of the sibling.

Puckering et al (1995) conducted a study to see Mother-Child interaction and the cognitive and behavioural development of children with poor growth. It was observed that the cognitive development of 23 inner-city children identified as stunted in growth, but otherwise healthy, was significantly retarded as compared to a matched group. Child behavioural adjustment in both groups was linked to maternal negativity.

Agarwal et al (1991 b) showed that effect of home environment in development and intelligence was of higher magnitude as compared to status and family variable and nutritional status during 1-3 years of age.
Denise et al. (1984) found no systematic significant relationships between difficult temperament and other aspects of infants development, parental characteristics or the home environment.

Karg et al. (1992) revealed that environmental problems affecting the development of thought processes and nutrient intake proceed both growth and learning failure. Both weight and height were significantly related to a measure of neurodevelopment.

David et al. (1993) reported that frequent family relation was associated with delay in growth or development, learning disorders, school failure and frequent behavioural problems in these children.

Vazir et al. (1998) conducted a study to assess the psycho-social development of well nourished and mal-nourished children aged 0-6 years. The results revealed that mal-nourished children attained developmental milestones at a later age. Developmental delay among the mal-nourished was especially observed in areas like vision and fine motor, language and comprehension and personal social. The delay was to the extent of 7-11 months in these areas in different age groups. Paternal involvement with child care especially, father spending time, telling stories and taking child for outing was found to be important for positive psycho-social development. Others significant factors included parents teaching child, small family size and paternal occupation.

Bhargava et al. (1982) a longitudinal study language development in small-for-dates children from birth to 5 years. The study comprised 40 normal small-for-date children and forty normal term infants weighing 2501 g. Both the groups were matched on major dimensions of socioeconomic status, such as per capita income, maternal education, number of sibling and sex. The results indicated widening of the
developmental gap between the two groups with the advancement of age. This trend in
development brought into fore that there is an innate parallel cognitive ability which
proceeds and advances verbal language development over the period of development.
This non-verbal language ability is abstract by nature. The small-for-date children
suffered a developmental arrest in the acquisition of abstraction and hence the gap
widened progressively with the advancement of age.

Chathopadhay (1971) found that sex difference were not significant in
language development. Urban children were better than rural children. Children of
educated parents were found to be better in language development than children of less
educated parents.

Saraswati (1989) has reported that there was a positive relationship between
cognitive and social development of children. It was found be better than that of the
rural children. Cognitive and social development were related to variables like
educational and occupational level of the parents, size of the family and family
income.

The longitudinal growth studies were undertaken at Baroda to collect
information about how children progress during infancy and to compare their
performances with that of babies from other countries. The adopted version of
Bayley's scale of infants development was used. The results revealed that there is close
association between motor and mental development. The exploratory analyses of the
babies classified into accelerated and related growth patterns indicate trends of
relationship, with the type of growth pattern for following factors-parental education,
age difference between parents, family income, father's occupation, child's birth
weight and birth order. The urban upper Socioeconomic group seems to perform
better, except for the first 6-7 months on the motor scale. The urban environment
suggests a positive influence on the mental performance of babies. The trends of motor and mental scores on Bayley scales of Infant Development Research Form -1961 tend to be similar in India, America, British and Israel babies. Indian babies, especially upper S.F. group tend to score higher than American, British and Israel babies on the motor scale for the first 15 months. American babies surpass after 16 months. On the mental scale babies from Upper S-class in Baroda score higher than American and British babies. Israel babies score highest.

Muralidharan and Bevli (1990) conducted a study on the growth and development of Indian children in aspects such as motor, adaptive, social-personal and language. The study revealed that urban children are faster in their development compared to the rural and industrial children. The industrial children were found to be better than their rural counter parts. Children of Calcutta and Hyderabad showed a faster rate of development in various aspect when compared with Gesell norms. Indian children showed retardation where handling of picture books or picture cards was involved.

In another multi centric study involving more than 13,000 rural tribal and urban children aged 0-6 years (WHO-ICMR study, 1991) it was found that urban children attained some of the gross motor skills such as lifting head while on stomach, standing alone, walking backwards and hopping at a slightly younger age compared to their rural and tribal counter parts. Other gross motor skills such as, standing on one foot with support, carrying a wooden block on head, and getting up from squatting position, were attained at younger ages by rural tribal children compared to urban children.

Susan et al (1990) conducted a study on 66 Haitian-American children to determine the parental and early childhood influences on the development. Results
showed that the urban sample was advanced on the mental Development Index of the Bayley scales. Regression analyses showed birth weight and the Home Score measuring child-rearing environment to be significant predictors of mental development, while psychomotor development was related to birth weight and household crowding.

Li and Zhang (1998) found that there was significant differences in physical development and growth of children between various regions. They concluded that regional differences in the development and growth of children is still present in China, but, begins to narrow.

Phatak (1974) conducted a longitudinal study to test the motor and mental development of babies up to 30 months. The results showed that the differentiating feature of patterns started manifesting clearly after the age of 13 months. Mothers education, fathers education and family income showed significant relationship with accelerated and retarded pattern during the second year of life. The higher level of each of these factors was related to the accelerated patterns. Birth order (beyond 4) suggested some relations with the patterns of development under study.

In a study conducted by Bhogle (1979) results revealed that children when provided with supplementary food and basic child care through medical help improved considerably. The results showed that children in experimental groups were superior to children in the control group in their motor development and that control group children who were denied the program showed general retardation, particularly after the age of 18-20 months.

Abrol et al (1994) in the study revealed that full term SFD (small for date) performed significantly poorly on all items under cluster interactive processes. They
performed poorly in clusters of motor processes and organizational processes. (state control)

Godbole et al (1977) conducted a longitudinal study on sixty high risk babies and followed them for a period of one year. Bayley scales of Infant Development (Baroda Norms) was used for assessing the outcome at one year. The results revealed that babies with absence of social smile, abnormal neuro behaviour at three months and absent pulling to sit position, absent voluntary reach and absent voluntary reach and absent transfer of objects, remained delayed at one year. The specificity of each of these items was 100%. These items had a positive predictive value of 100%. The main objective of the study was to find out a few simple and easily elicitable items at three and six months of age that can predict neuro developmental outcome at one year in high risk babies.

Rose (1994) conducted a study to examine the relation between physical growth and cognitive development in infants growing in India. Underweight infants performed poorly on two cognitive measures and failed to show the clear age-related improvement in speed of processing found among the heavier infants.