CHAPTER I

FIRST FIFTEEN MONTHS OF LIFE

Introduction :

Human beings are born with a great dynamic potential that interacts with its environment and evolves into adult achievement that guides the destiny of the human race. These adults who probe the outer space and the ocean depths, who create the great human heritage, who explore, guide and heal the gamut of human emotions, all have their beginnings in the helpless human neonate that is nurtured, given opportunities to develop its potential and protected during infancy. Many great human contributions have resulted because of this nurturing and strangely enough, inspite of it. There are countless examples of potential abilities having flourished with nurturing and having contributed to our heritage; but Ramanujan, the mathematician is an example of the genius triumphing in spite of lack of nurturing. And yet, for every Ramanujan who contributed to the affairs of men, there must be a

hundred others who silently went to their funeral pyres with their potentialities never bearing fruit, for lack of proper nurturing. Burks et al., 1930[1] and Terman and Oden 1947[2] report case studies of superior individuals labelled as gifted who eventually disrupted emotionally under adverse conditions and disastrous relationships.

Today we are becoming increasingly aware of the significance of the early years of human life as we probe deeper to understand human suffering - physical, emotional, social and intellectual. Many of the world's present day social evils also have their roots in infancy and early childhood.

When we think of the number of physically handicapped in our society; those who have been denied proper nutrition resulting in blindness and ricketts; denied adequate protection of body and life resulting in deafness due to small-pox or maimed limbs due to polio or accidents; or denied proper education when they were born with retarded physical functions but with an alert mind that could have responded to training, viz.,

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1. Burks, B.S., D.W.Jensen, and L.M.Terman (1930). Genetic studies of Genius; Vol.III. The promise of youth; follow up studies of a thousand gifted children - Standford Uni. California; Standford University Press.

2. Terman, L.M. and M.Oden 1947. The Gifted Child Grows up Standford Uni. Press, Standford University, California, U.S.A.

the spastics; one is convinced about the importance of physical development during childhood.

Very close human contact in the affairs of man has become a reality in this jet age. We can no longer hope to live and die in obscurity either as individuals, communities or nations. 'How,' 'when' and 'what' of our survival is continually affected by the achievements and failures of human beings other than ourselves. The doctor who failed to diagnose a rare malady in the infant twin who died as a result of it; and the doctor who readily recognised the infant killer and was able to support and save the life of the other twin, both arrived at the cross-roads of their achievement and failure on the long road of human development which has its beginnings in conception, birth, and infancy.

As Mussen et al (1970)[1] point out, study of the growth of development in the sixties has accentuated at a tremendous tempo. The successful voyage to the moon and back, has marked the erruption of an era of upheaval in a complex rapidly changing world. The youth explosion all over, including our country, and the unexpected violence, lack of controls, intrinsic and

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1. Mussen, P.H., J.J.Conger, and Jerome Kagan 1970. Readings in child Development and Personality, Harper & Row: New York, Evanston, London, Preface to the second edition.

extrinsic, and total rejection of time honoured traditions that have held the institutions of societies everywhere together, have focussed attention on the search for understanding and solution of the youthful society's 'problems'. People concerned with these problems are looking for their origin in the early experiences of today's youth. It seems to them that the first few years of life, especially infancy, are the beginning of this process of unrest, anxiety, and destruction of the creative forces within the individual, but the important problem of infancy is survival, which is rooted in the physical well being of the infant.

It is a well known fact that the baby who lives beyond the first month of life must live beyond the first year of life to hope to survive. This is especially true in our country, where the infant mortality rate is one of the highest in the world. It is alarming to note that around 1969, death rate in rural India for 0-4 years age group was 64% of the total for that group. Infant mortality rate for the country was 139.9 per 1000 live births for 1968-1969. Even though this varies greatly between the different states of the country; the pooled mortality rate for Gujarat, Rajasthan, and Uttar Pradesh is 140. Rural infant mortality is

greatly in excess of urban rates; urban rates being 20% and the rural rates for the country being 79%.[1]

Infant mortality is one of the many fronts on which India is waging a battle for a brighter future for her people. In light of the crash program adopted by the Government on the family planning scheme for the country, the efforts to protect the infants and to help them to survive to adulthood must be vigorous and continuous.

To fulfill this pledge to the people we need information about the infancy period in depth and scope. In the last few years quite a few studies have been published in the field of child development, but the studies on infancy are far and few in between. Thus the mysteries of the physical growth and development during the first fifteen months of life in our country, must be unlocked as the first fundamental step.

Research on the gifted has contributed to related areas of investigations. The somatic implications (or those pertaining to the physical body) are that derivation from sound somatic stock, favourable

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1. Sinclair, Seeta, Vital Statistics. Indian Pediatrics, Vol.X, No.1, Jan.1973.

nurture in infancy, personal associations and interrelationships with stable, generally well adjusted people, and freedom from nervous symptoms and personal maladjustment are conditions and factors found to be operating among the gifted to be ... the most frequent among those who continued to develop favourably from childhood onward. "The hypothesis that superior innate somatic potentials will tend to become manifest in identifiably superior child personalities is supported by this data". [1]

Process of Growth and Development :

Growth and development is the process by which the organism moves through the life cycle; from origin to immaturity to maturity and eventually to death. It is never separate from the organism, never independent. This process occures within the individual and goes on irrespective of external factors. Doubtless the external factors influence it but the process is not dependent on them.

Human development, as observed by its students is not even. Either in its rate of growth or its manifold aspects. Rather it is a piognantly mysterious

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1. Miles. Catherine Cox, (1968). The Gifted children. Chapter 16. In Carmichael, L.(Ed). Manual of Child Psychology. 2nd Ed. Wiley Eastern Private Ltd. New Delhi, p.1049.

unfolding of the human adult who sports a handsome and beautiful physique, penetrating and brilliant intellect, a warm and sensitive emotional depth of multifarious moods, and an infinite capacity for community life that is unparalled in the known history of the universe. A unique synthesis of these various kinds of energies results in a creative force that has built the human heritage and is daily contributed to, by many individuals for posterity.

The process of human development is very complex and takes a long time - eighteen to twenty years, which is the longest state of helplessness requiring nurturing in all animal kingdom. No other young animal needs protection and guidance for a longer period of time than the human young. This process is also full of pitfalls, more of these abound in early childhood, and seem to diminish in quantity but perhaps not in quality as adulthood is approached. Similarly, there are many opportunities for stimulating and nourishing the hidden wealth of potential in the developmental process. The responsibility to recognise these pitfalls and opportunities, to avoid the disasters of permanent damage, to nourish stimulate and train the opportunities for great creative achievement in the new generation falls on the adults who run the affairs of men.

The unevenness of the developmental process nontheless yields a pattern that is universal for all human beings irrespective of their race, geographical habitate or living habits. This is evidenced by the fact that all human neonates are helpless, that they sit up before they learn to stand and that they must assume the erect posture before they learn to walk. The mastering of these various milestones is a variable factor highly individualistic with genetic overtones and environmental factors contributing to it. Yet, the pattern remains the same. The sequence of the increasing complexity of structure and function of the human organizm in its many aspects makes up this pattern.

Developmental Aspects :

Maturation :

In 1929, Gesell [1] popularised this term borrowed from the geneticists when he wrote "Growth is a process so intricate and so sensitive that there must be powerful stabilising factors, intrinsic rather than extrinsic, which preserve the balance of the total pattern and the direction of growth trend. Maturation is, in a sense, a name for this regulatory mechanism."

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1. Gesell, A. 1929. Maturation and infant behaviour pattern. Psychological Review, 36, 307-319.

Later on in 1942, McGeoch[1] defined the concept in terms of change in behaviour thus : " Maturation.... includes any change with age in conditions of learning which depends primarily upon organic growth factors rather than upon prior practice of experience". In other words, maturation signifies the increasing complexity of structure and function in its progress towards adulthood. It is an important independent variable over which man, as yet, has little or no control.

Growth and development are really two aspects of maturation which cannot be sharply differentiated. The term "growth and development is generally given a unitary meaning implying both the magnitude and quality of maturational changes".[2]

As Nelson (1966) further points out, these changes are physical, emotional, and intellectual. Physical aspects of growth and development are related to the size, and function of the human organism. Functional changes range from the molecular during fetal life, to ..... activated enzyme systems in the neonate, to ..... complex metabolic changes during puberty and adolescence.

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1. McGeoch, J.A.1942. The Psychology of Human learning Longmans; New York.
2. Nelson, Waldo E.(Ed) 1966. Textbook of Pediatrics. W.B.Saunders Company. VIIIth Edition, Asia. p.14.

Emotional growth and development depends on the infant's (i) ability to establish meaningful bonds of feelings with persons important to him; (ii) capacity for love and affection; (iii) ability to handle anxiety arising out of frustration; and (iv) ability to control aggressive impulses. Each child must learn to cope with these aspects of his emotional life. The ability to deal with them is aquired by social and cultural growth and development which are the strongest determinants of emotional maturity. Learning is inherent in this aspect of maturation.

Intellectual growth and development are difficult to differentiate from the neurological and behavioural maturation in early infancy. As the child continues to grow, the intellectual function is increasingly measured by (i) communicative skills and (ii) ability to handle symbolic and abstract material.

Thus, helpless newborn becomes self sufficient in the matters of intake of food, hygiene, and the use of the body for satisfactions of his many needs. The developmental task during this early period is mainly structural and functional physical maturation. The fact that the human being is a social animal is evidenced as soon as the infant responds to an adult smile in the first months of life. Similarly, the emotional

expression of pain and pleasure of the infant give us insight into the emotional aspect of his development. The largeness and complexity of the human brain and its potential for abstract thinking, learning, and its capacity to remember, are features of the third and important aspect of human development viz., the intellectual. Thus, the aspects of human development are physical, those of the structure and function of the physical body; emotional of the mental life of the organism; social, of the interaction with other individuals of the human race; and those of behaviour, of the interaction with his total environment.

Developmental Forces :

The developmental process in its manifold aspects is accelerated or retarded by two main forces. These are heredity and environment of the individual in which he is growing. For example, an infant, born with a brain that is small in size, (microcephalic), is not going to be able to develop into a genius; or by the same token, an infant with a relatively large brain and a sharp intellect, but deprived environment may not be able to achieve to the fullest extent of his potential because of his adverse environment.

Stern (1960)[1] defines - 'heredity' as all those characteristics that an individual inherits from both his parents. As soon as the fertilised egg starts to divide, these characteristics or traits known as genes also divide with the help of their physical vehicle, the chromosomes. This division takes place in such a fashion that the genes are homogeniously distributed throughout the growing organism. It is estimated that some 10,000 pairs of genes of two assortments are harboured by the human individual.

The term 'environment' describes all those non-genetic external circumstances that influence the growing organism before, at, or after birth.

Hughes (1959)[2], while discussing the biological basis of development states that researches in biology, biochemistry, and biophysics, have established that there is no well defined boundry between the living and the non-living organic structure. In other words, a protein-molecule acts like a living substance in one environment and non-living in another. Crystalline viruses such as the tobacco mosaic virus exhibits this quality. This discovery has far reaching repercussions, in as much as

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1. Stern, Curt, 1960. Principles of Human Genetics W.H. Freeman and Company, San Fransisco and London. Toppan Company Ltd. Tokyo, Japan, Freeman International Edition.
2. Hughes, Byron O.(1959). The biological basis of development. Merrill-Palmer Quarterly. Vol.5, No.2 Winter 1959.

it makes 'environment' the difference between life and death. This environment is made up of many factors, varied and independent.

The interaction of the genetic constitution and environment in the production of the phenotype is well-known. The contribution of this 'third force' on the growing individual is not additive. It may affect the share of either the heriditary or the environmental influences in the varience observed in human traits. Stern (1960)[1] gives an example of this. He states that the condition of the prenatal environment of identical twins, which causes the death of one partner, may be responsible for the other partner's selection of an environment markedly different than the one, the two together would have lived in. Thus, "the share of the heredity and environment, whatever it may be, at any stage in history or any locality, is not fixed."

Thus, neither of these two forces are independent of each other. In other words, one cannot ask "How much of a specific trait of an individual is due to heridity and how much to environment", but rather, the question should be "How much of the variability observed between

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1. Stern, Curt, 1960. Principles of Human Genetics W.H. Freeman and Company, San Fransisco and Rondon. Toppan Company Ltd. Tokyo, Japan, Freeman International Edition.

different individuals is due to hereditary differences between them, and how much to differences in the environments under which the individuals developed ?" Even this question is not precise as it is not applicable to 'the' phenotype as a whole, but only to well-definable, measureable, or classifiable components. Therefore the question regarding relative roles of heridity and environment in the differences between individuals must be applied separately to measureable components of the phynotype and will often lead to a different answer for each separate component. Further it cannot be taken for granted that the effect of one environmental factor on the expression of one genotype can be predicted from the known effect of the same factor on another type; because these effects in some cases may be similar and in others dissimilar. Stern (1960)[1] illustrates this point in the following manner :

Environmental Factor		Genotype	Effect
I	Increased food intake	large body	increased body wt.
	" " "	small "	" " "
II	Add sugar to sufar-free diet	non-diabetic	no adverse effects
	" " "	diabetic	serious trouble
III	Add milk to veg.diet	allergic to milk	serious trouble
	" " "	not allergic to milk	improved health
IV	High demand	highly intelli-gent	thrives
	" "	limited inte-lligence	completely fail

1. Stern, Curt, 1960. Principles of Human Genetics W.H. Freeman and Company, San Fransisco and Rondon. Toppan Company Ltd. Tokyo, Japan, Freeman International Edition.

The growth and development of the human being is thus shaped by the genetic programme that the individual is born with and the environment in which he lives. However, the actual attainments of growth and development are profoundly influenced by the nature of the interaction between his heredity and the his environment. Depending upon the nature of this interaction the share of 'heredity' or 'environment' shape the variety observed in human traits.

Developmental goals of the first fifteen months of life :

Griffith (1954)[1] points out that human development differs from that of other animals in three main directions :-

(i) Achievement of the upright posture.

(ii) Use of his hands for manipulative skills after learning to walk, and

(iii) Development and function of speech, which is a motor skill of great delicacy and complexity, a means of social communication necessary for community life, and a symbolic means of expression that forms the basis of intellectual life.

All these are achieved by the average child in the first fifteen months of life.

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1. Griffith Ruth, 1954. The Abilities of Babies : A study in Mental Measurement, New York: McGraw-Hill.

According to Buhler (1935)[1] the first year of life lays the foundation of mental development in all its aspects. Thus, the experiences of infancy determine in no small way, the evolution of individual personality.

An infant is not a miniature adult human, rather, it is an incompletely developed human being who completes many of his developmental tasks during infancy.

The baby during this period undergoes a continuous change. It travels a great distance from being a squirming, sleepy, disorganised, totally helpless neonate to the walking, talking, socially discriminating and perceptive humanbeing that emerges at the end of infancy. In fact, it almost seems that, it is in these early months of life that many of the tasks begun at conception to finish the blueprint of a new human being, are completed. The rate at which each of these tasks are completed are specific to their nature. Physical growth continue after birth, for the period of infancy, to take place at rates characteristic of their fetal life. Towards the end of infancy, they seem to enter the period of stability till they reach adolescence.

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1. Buhler, C., and Hetzer H.1935. Testing Children's Development from Birth to school age. New York : Fawar Rinehart.

Effects of Nutrition on rates of growth :

Greulich (1957)[1] showed that improved nutrition increases rates of growth. Correspondingly undernourished babies are small and grow slowly; (Dean 1951)[2]. Through the large scale investigations done by international agencies, systemic studies have been made of the effects of generalised malnutrition, recovery from malnutrition, and the effects of malnutrition on intellectual as well as physical growth. Dean (1960)[3] in working with African children suffering from kwashiorker, suggests that infants show sharp gains in height and weight when given supplementary diets to correct the caloric defficiency but they never achieve the standard in their physical measurements. Further work in 1962 leads him even to suggest that there may be a falling away from expected development after the age of four years eventhough the children continue on adequate diet.

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1. Greulich, W.W.1957. A comparison of the Physical Growth and Development of American born and native Japanese Children. American Journal of Physical Anthropology, 15, 489-515.
2. Dean, R.F.A.1951. The size of the baby at birth and the yield of breast milk. Studies of undernourishment, Wuppertal 1946-1949. Special Report Service med, Research Council, London No.275.
3. Dean, R.F.A.1960. Treatment of Kwashiorker with moderate amounts of protein. Journal of Pediatrics 56, 675-689.

While discussing the nutritional modification of body size, Garn[1] (1966) says " The proposition that body size can be modified by nutrition, during growth needs scarce qualification today. It can be documented from the prenatal period through the completion of epiphyseal union. It can be shown experimentally in laboratory animals (Dickerson & McCance, 1961; Platt & Stewart, 1962) and it can be shown by a multitude of natural experiments, including famines, in man. It can be shown in relation to nutritional status, rating separately the caloric intake, the protein intake, and intake of fat soluble vitamins. It can be shown in relation to socio-economic status, where such status reflects the caloric reserve. The nutritional modification of stature and body size can also be demonstrated in malabsorption syndromes, where available nutrients are unable to pass through the gut. Regulating the amount of food available, within broad limits, regulates body size (Acheson, 1960). Body size can be modified upto a point even prenatally inspite of the peculiarly 'parasitic' nature of the maternal-fetal relationship (Smith, 1947). This was demonstrated during famine situations, when the body size of the newborn was reduced when the maternal caloric intake fell below 1500 per day. Thus size in infancy is both directly influenced by nutrition and indirectly influenced by diseases that malnutrition breeds."

Since, a healthy physique is the first requirement of survival, our knowledge of the physical norms of our

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1. Garn, Stanley, M. 1966. In Hoffman, L.W. and Hoffman M.L., Review of Child Development Vol.II, Russell Sage Foundation, N.Y. p.550.

infants becomes indispensable. Measures of the infants serve three functions : (i) Establishment of developmental norms, (ii) Assessment of individual variation, and (iii) Diagnosis of the process or structure (i.e. the measure of the interaction between infant and environment).[1]

Factors leading to variability in early Physical Growth :

Merminod (1962)[2] and Falkner (1966)[3] while reviewing work on external measurements amongst other measures present currently available data on the variability in early physical growth that could be dependent on nutrition, social class differentiation and sex differences.

Physical growth is the basis of all human development and it is essential to understand how it progresses and how, if at all, it is modified by the major realities of sex, social class age and residence. (urban and rural).

An attempt is made to high light the salient features of physical growth during infancy, beginning from conception till the infant emerges as a miniature human being. These features are discussed in the next chapter.

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1. Kessen, W., Marshall M.Haith, Phillip H.Salapatek Mussen, Paul H.(Ed). Carmichael's Manual of Child Psychology, Vol.I. 5.Human Infancy: A Bibliography & Guide.
2. Merminod, A.1962 (Ed). The Growth of the normal child during the first three years of life. Basel: Karger,1962.
3. Falkner F.Karger 1966 (Ed). Human Development, Philadelphia, Pa. Saunders.