CHAPTER 1

INTRODUCTION
Childhood is the most important period of life. Piaget has classified child development in 4 stages 1) infancy 2) the preoperational period 3) the period of concrete operations and 4) the period of formal operation. The period of concrete operation is the toughest period of childhood which stretches from age of 6 to 10 years. Piaget has stated that qualitative changes in cognition are replaced, for the most part by a quantitative expansion of knowledge and skills.

The systematic and scientific study of child development is a relatively new aspect. It has occurred in the past 100 years. 90% studies have been accumulated in the past 20 years. Piaget has suggested that children go through qualitatively distinct stages in developing their understanding of the world. Children construct reality on the basis of their interactions with the environment and the feedback they get from it. The nature of construction changes several times in the course of development. First theory of child development had religious background with the belief that, "peoples destiny is determined by the will of God." Another theory is based on philosophical background that "Are, the body and mind separate or are they connected?" if so, how much they influence each other, but Piaget's theory is appropriate in this field.
In recent years there has been expansion of programme in all fields of social action in our country at all levels of economic development. The development and the maintenance of public health institutions and services and other amenities, feeding needy school children, and nutrition education programmes are some of the important aspects in which Government is keenly interested.

Physical as well as mental development is an indicator of positive health of a child. According to W.H.O. "Primary health care", therefore, is an essential health care and has been made universally accessible to individuals and families in the community by means acceptable to them through their full participation and at a cost that the community and country can afford.\textsuperscript{1}

Childhood is a growing period, hence positive health & adequate nutrition is required. State of nutrition (nutritional status) is the best parameter by which we can assess children's health. Physical development shall proceed smoothly if children get adequate nutrition. Children need nutritious and balanced diets to ensure continuous healthy growth. Good nutrition is related to educational progress. Poor nutrition may inhibit the child's ability to learn and to cope with school life and hence undernutrition is the main cause of suboptimal physical and mental
development. Several studies have shown that good nutrition improves not only physical and mental growth but also the working capacity\(^2\).

Positive health of a community in turn is ensured by good nutrition. The nutritional status of a population is a major determinant of health status and is conventionally used as such. Young children when still in formative stage of development, can be guided to optimal state of physical and mental growth by monitoring their nutrition, assessing their overall health status and suggesting the required changes and modifications.

The average Indian is poor and cannot afford adequate food in terms of quality and quantity for his children. Similarly he cannot arrange for their good schooling as well. Government has planned primary and even high school education compulsory and free. The widespread illiteracy, superstition and poverty are hampering the progress. Primary school education is a core of higher education. Without the basic knowledge, it would be difficult to have intelligent citizens aware of their duties and responsibilities\(^3\).

Growth proceeds unevenly with brief spurts alternating with longer periods of minimal growth. Spurts introduces new opportunities to children, as they become big enough to do things they could not do before.
Despite reasonable achievements in some fields, it is difficult to explain the widespread undernutrition in our country. We have failed to convince the policy makers that, "successful macroeconomic development does not mean adequate nutrition for the masses". It should be kept in mind that health status of the children is a highly reliable index of the health of country's population. Protein-Calorie malnutrition is a major problem among children. Government of India had announced during the IIIrd five year plan mid-day meal program and free and compulsory education for school children to 1) raise the level of nutritional status 2) be an incentive to parents of poor means to send their children to schools so as to improve the attendance, and 3) be a direct method of nutrition education to the parents. This was first implemented in Andhra Pradesh. Data on the physical status is useful for health planners. Data on children could be used to detect and control nutritional deficiency and could also be used to study the factors affecting the normal growth and development in children.

Although much work has been done to assess the growth and development of children in India, no attempt has been made to study the normal growth and mental development of Indian children and correlate these developments with the socio-economic, cultural and psychological factors. Scattered information is
available on 1) rate and pattern of growth 2) norms of physical characteristics like height, weight, chest circumference by age and sex 3) norms of intelligence, characteristics as measured by tests of age and sex 4) prevalence of deficiency signs of age and sex, and norms for haemoglobin estimated by age and sex.

So far several studies have been undertaken on the different indices of health of a community and it has become clear that the most important approach for finding an effective solution to the problems of malnutrition and retarded growth (both physical and mental) is to take care of the state of nutrition and physical and mental growth of school children. World Health Organisation has also given importance to this approach. W.H.O. has reported that 10% of the world's population (children) is suffering from mental disorders. 4/5th of them live in developing countries. 25-30% slum children are suffering from mental disorders. As a result, W.H.O. had accepted the importance of mental health in primary health care in 1951. W.H.O. has recommended that mental health should receive special attention in every aspect of health activity and should be included as an important element in primary health care. Through mental health services -we can identify these types of families and children with obvious problems.
The brain grows rapidly in the first two years of life. The cerebellum which controls co-ordination and balance grows earlier and faster than the two divisions of the brain, namely, the forebrain and brain stem. The cerebellum completes its growth by the end of the first year. The infant is able to stand with help at eight months. The brain as a whole achieves 75% growth when the child is three years old and 90% by the age of six years. This indicates the need for adequate nutrition during infancy and early childhood. Malnutrition in this period affects the growth of body and of the brain.

As it is said earlier average Indian is poor and cannot afford adequate nutrition. The main task of school-going child is learning and good health is prerequisite for good learning. The task of learning is made difficult by nutritional deficiencies of various types. Adequate nutrition in quality and quantity in childhood is of paramount importance in ensuring physical and mental development, since both these developments are interrelated and run unidirectionally, parallel to each other.

School is a necessary and vital institution, but it is observed that overcrowding in classroom, unhygienic environment, inadequate availability of water, all these factors affect school attendance, lower learning ability and performance. Dr. Gopalan has
pointed out this as "undernutrition syndrome". Talking on fifteenth anniversary of Nutrition foundation of India, he traces that the qualitative dimension of India's population does not get the attention that its quantitative dimension does.

As it is already pointed out nutrition programme of this group will be useful to overcome malnutrition problem. The school age population is easy to study because most of them are in schools and they are easily contacted as a group in the schools. Government's mid-day meal programme shall ensure better attendance and reduce dropout from school. Moreover, as the programme of compulsory education becomes more and more successful enforcing all the children of school age to be present in the schools, the group shall be covered to a very large extent. Although this study covers only those children (of school going age) who actually go to schools.

Since India is a vast subcontinent with diverse racial, linguistic, religious and other ethnic groups a study covering as many groups as possible should be of utmost value for comparative purposes. The socio-economic data should be collected along with cultural factors because cognitive style has theoretical and practical implications, which combines cognitive development with personality development and appear to be shaped through socialization.
Mental development is stimulated at home, if parents take time to do so by reading for children, listening to them and playing with them. Formal mental development occurs at school, where children learn fundamentals. Curiosity and creativity provoke continuous interest in children whose environment is rich, learn more words and thus have larger vocabulary. They learn to use words for communicating, thinking and problem solving more effectively.

Thus correct and scientific study on the growth patterns (physical and mental) and socio-economic factors would be of considerable value in defining baseline for the existing child population and child problems. Since nutrition, physical health and mental health are closely interrelated, this study was undertaken as an attempt to bring these relationships along with other closely related factors.

**BRIEF BACKGROUND:**

Studies on the interrelationship between nutrition, health status and mental status have been few, primarily because of the difficulties in developing suitable types of tests to give meaningful results, on the function of brain in young children. These studies need to use standard techniques and a reasonably long term stretching.
Brozek has compiled an overview of topics covered in various conferences dedicated to malnutrition and behaviour. The symposium on nutrition and behaviour held in 1916, had a special section on the impact of deficient diets on the behaviour of rats, dogs and man. In mid 1950, researchers directed their attention to Protein-calorie malnutrition in young children and first such conference was held in 1967. It was generally felt that various forms of malnutrition affect in different manner. Cravioto and Delicardie, in their analysis of nutrition, behaviour and learning summarized that children who survive a severe episode of malnutrition of sufficient duration early in life are handicapped in learning some of the fundamental academic skills. Similar results were reported by Monckeberg, Pollitt and Chase and Martin.

Cabak and Naj clanvic examined 36 children in the age group of 4-24 months, who were hospitalized for the treatment of Marasmus. They assessed the same sample between the age group of 7-14 years. Their results indicated normal physical growth but subnormal mental activity. Pen hein liang et al assessed the intelligence quotient in a group of Indonesian children aged 5-12 years using Goodnough’s scale and reported significantly lower I.Q. in children who had suffered from Vitamin 'A' deficiency at the age of 2-4 years.
Champakam et al.\textsuperscript{14} studied Indian children who had been successfully treated for kwashiorkor when they were 18-36 months old. \textit{At the time of assessing mental development, these children were between 8-11 years of age. Their results of mental performance showed a significant difference between control group and these children.} A Group of school children were studied by Cravioto.\textsuperscript{15} He concluded that environment affects mental performance.

Scott\textsuperscript{16} has established functional deformities of young rats as a result of specific amino acid deficiencies. Similar study was made by Flexner et al.\textsuperscript{17}. Reduction in brain size in children has been found by Winick\textsuperscript{18} and Brown\textsuperscript{19}.

However, in a symposium held in saltsjobaden, Sweden in August 1973 in conjunction with W.H.O., it was reported that there is no evidence of relation between malnutrition and mental function. Mental function on the other hand was shown to be highly affected by other environmental factors\textsuperscript{20}. Shrikantia\textsuperscript{21} also suggested that factors other than malnutrition like mother child relationship, poverty, illiteracy of parents also affect the mental development.

Ramachandran et al.\textsuperscript{22} made study on primary school children of Bombay city to study the physical mental development and physical work efficiency. He
found Gujarati children superior to Marathi children. Children from Municipal schools were found inferior to non-municipal schools. They found positive correlation between physical, mental development and physical work capacity.

Tanner et al.\textsuperscript{23} had worked on physical and mental development. They found that children who showed rapid physical growth were also slightly advanced in mental growth. They scored a bit higher on standard I.Q. and did better in school than slowly developing peers. Golden et al.\textsuperscript{24} reported that children from poor and working class families had lower I.Q. than children from middle class families. An ICMR\textsuperscript{25} (Indian council for Medical Research) bulletin also brings out the observation that along with nutrition some other environmental factors also cause mental retardation. These results were confirmed by Latham\textsuperscript{26}.

Upadhyay et al.\textsuperscript{27} reported that severe, moderate and mild malnutrition affect the intellectual level but the effect of moderate malnutrition is of a high magnitude on immediate memory, visual perception and comprehension. Besides above, some reports show that undernutrition in early life affects the physical and mental development. When the body measurements like weight and height were less than normal, even the intelligence score was also below normal. Such observations were confirmed by Margret\textsuperscript{28} and Pollitt\textsuperscript{29}. 
Agrawal et al. worked on 1336 primary school children and reported that malnutrition declines I.Q. levels. They reported that only 15.7% primary school children were normal whereas 50.4% had mild, 31.5% had moderate and 2.4% had severe malnourished. Half of the children were anemic having haemoglobin less than 10 gm/dl. The study revealed that anemia was associated with physical and mental impairment.

Researches have shown that Iron deficiency anaemia adversely affects the cognitive function of preschoolers. Thomas et al. studied the effect of Iron deficiency on cognitive performance in rats and suggested that some aspects of association learning was adversely affected by iron deficiency anaemia in human beings. Iron deficiency causes fatigue, anorexia, irritability and impaired perceptual ability.

Experiments on animals have shown that Iron deficient animals needed more shocks for learning than control group. Anjaria et al. in their study on 481 school children between the age groups of 7-10 years, found that anaemia leads to poor mental performance but moderate malnutrition does not affect mental function. Similar observations were made by Soemantri et al., Webb et al. and Sheshadri et al.
W.H.O. reports that in 118 countries 157 million people are suffering from Iron deficiency disorder. This is the greatest cause of brain damage in infants and children. Walter et al examined the effect of short term Iron therapy on development test scores of infants with various stages of Iron deficiency. 37 children were tested. The result showed that mental development index was significantly lower in anaemic children before treatment as compared to normal. Rajajee in her paper on nutritional anaemias stated that Iron deficiency anaemia causes impaired mental function.

Richardson in his study showed that malnutrition in early life adversely affects the intellectual development. The study was conducted on Jamaican boys and confirmed the retardation of intelligence in the under nourished group when compared to normal. Badonia et al stated that out of children who were admitted for treatment in the hospital, majority were in the range of I.Q. 90-109. The lowest I.Q. recorded was 40 and the highest was 140.

Birch et al studied intellectual level of school boys who were severely malnourished during the first 2 years of life. All I.Q. measures were significantly lower in these cases. Similar results were obtained by Stoch. A follow up study was conducted on
all Barbados children who were treated for Kwashiorkor in their early life. The result showed that at the age of 5-11 years, these children performed poorly. The I.Q. level of these children was lower than the normal. Agarwals in his study stated that learning ability of rural primary school children was poor. Similar results were obtained for orphan children also.

Relation between growth status and mental function was examined on 215 male and female preschool children. The report confirmed the positive relation between growth status and mental function. The physical aspect of malnutrition has been studied for many years and it has been established that under nutrition in infancy and childhood may cause irreversible changes. The U.S. national health survey of 7119 children of ages 6-11 years demonstrated positive relation between height and intelligence scores.

A comparative study of rural and urban primary school children was made by Gupta et al. to find out clinical features of malnutrition. Another study was done by Sharma and Vazir who examined nutritional and psychological profile of institutionalized children. Satya Narayan et al. studied the effect of nutritional deprivation in childhood. They found positive correlation between nutrition deficiency body size and activity.
Chatterjee\textsuperscript{52} made a study on 656 Indian Bengali girls of lower and middle class to find out the growth pattern. She found Bengali girls to be taller and heavier than Indian norms for low socio-economic class. A study conducted on 200 preschool children of Gangwa village showed that anthropometric measurements were higher than ICMR standards\textsuperscript{53}. Singh et al\textsuperscript{54} surveyed nutritional status of rural primary school children of Maharashtra. They observed that socio-economic status influences the health status. Similar results were obtained by Vijaylaxmi for tribal children of Andhra Pradesh\textsuperscript{55}.

Pai\textsuperscript{56} evaluated the nutritional status of rural school children of Karnataka. Nutritional status including cross sectional anthropometry, clinical and dietary intake was examined by Gopaldas\textsuperscript{57}. Nutritional status of school children of rural Lucknow was studied by Gill et al\textsuperscript{58}. Charlott et al\textsuperscript{59} examined the nutritional status and anthropometric profile of 391 young rural children to find out relationship between nutrition and infection. Similar study was made by Bali et al\textsuperscript{60}. Subhash babu\textsuperscript{61} examined 1673 school children. Height and Weight measurements were used as an independent index for the assessment of nutritional status.
Besides above studies, diet surveys have also been carried out. Narsing Rao\textsuperscript{62} evaluated energy intake of preschoolers. Study of dietary intake amongst well to do adolescent boys and girls was made by Kapil\textsuperscript{63}. Relation between food intake, nutrient adequacy and anthropometry of adolescent was examined and established by Pushpamma et al\textsuperscript{64}. Another major problem of school children is vitamin 'A' deficiency. A comparative study of preschool children and school going children was made by Tandon et al\textsuperscript{65}. They observed high prevalence of clinical vitamin A deficiency. Similar results were obtained by Rajlaxmi\textsuperscript{66}.

Goyal et al\textsuperscript{67} examined 200 Government and Government aided primary school children to find out the effect of Vitamin A deficiency. The results showed high rate of Xerophthalmia. Joint report of W.H.O. shows Vitamin - A deficiency as a major health problem. Inadequate intake of Vitamin A is the most important cause of xerophthalmia in children. Allen et al\textsuperscript{68} surveyed the interactive effect of dietary quality on the growth and attained body size of young children.

Diet survey was made by Reddy\textsuperscript{69} on 323 school going children to find out nutritional status, food intake and socio-economic status. Mohanti\textsuperscript{70} investigated relation between calorie intake and growth status of tribal children. The influence of food intake on mental
development was examined by Galler. He stated that chronic hunger deprive the child's capacity to learn. Several other factors like inadequate nutrition and frequent infection also affect mental development.

As pointed out earlier mental development is highly affected by other environmental factors. Verma et al examined lower class and middle class school children and found significant difference between them. She found positive correlation between ability scores and social class. Relation between socio-economic status and physical growth was examined by Qamra and Deodhar. The result revealed that low socio-economic status girls were inferior in anthropometric measurements than higher socio-economic status girls.

Relationship between socio-economic factor and anthropometric measurement was examined by Hopkins. Similar studies were carried out by Vazir et al and Johnson et al respectively. Sigman et al has stated that parent education and awareness have a positive effect on cognitive development of a child. Arya and Devi worked on the same subject. They found that the children of literate mothers had better anthropometric measurements than children of illiterate mothers. Krishnamurthy, on slum children of Madras, observed similar results.
Relation between child development and socio-economic status was examined by Bhandari et al. The result showed positive relation between development and social class. Another case study was made by Visweswara and Balkrishna, who concluded that the educational level, occupation of parents and percapita income were the most important factors.

We have achieved good position in food production but malnutrition is still one of the critical issue in this field. Government of India has planned free and compulsory education for primary school children. Nutrition education program moves the individuals from ignorance to increasing appreciation and knowledge. Nutrition education offers a great opportunity to individuals to learn about the essentials of nutrition for health and take steps to improve the quality of diets. These nutrition programs should be considered as an investment in human resource development.

There are several studies on this subject. In our country 1st program was launched by Tamilnadu state in 1976, with the assistance of NCERT/UNICEF and the Government. Another study was made by Devdas who stated in her study that response was encouraging, the education given to children had a "Carry home" effect as it influenced the meal pattern and habits of the whole
family. She concluded that Nutrition Education Program is more successful with practical education like puppet show, screening film, chart and demonstrations.

**PRESENT WORK:**

Social and economic development of a country is difficult without the intellectual support of the population. Physical and mental health are thus prime necessities for the progress of nation. Though there are several studies in this region on school children, physical as well as mental development were not studied together. So the present study is designed to obtain base line data on school children of Raipur. Since it was impossible to study all the children of this area only a few schools were selected and from these schools a sample is drawn for this study. The study is conducted on 540 Government and Government aided primary school children of Raipur city to assess their physical development, in relation to their mental development.

Physical development is assessed by observing clinical signs and symptoms supported by anthropometric measurements, biochemical assessment, diet survey and socio economic survey of the children. Mental development in terms of intelligence quotient (I.Q.) is assessed. Physical development can be easily identified
by clinical examination. Clinical examination includes general examination of hair, lips, tongue, teeth, skin, nails, glands and face to determine the physical signs associated with malnutrition (Chapter No.-3).

The anthropometric measurements include height, weight and arm circumference. The actual recorded data are analysed for body mass index, relative body weight, weight for height, height, weight and arm circumference by age and sex (Chapter No.-4). Biochemical tests were used to estimate haemoglobin, which is compared with other data (Chapter No.-5). Socio-economic survey is performed to assess social, cultural, economic and psychological condition of subject. Socio-economic survey is performed by using Dr. Kulshreshtha's S.E. scale. All results are compared with other variables (Chapter No.-6).

Diet survey is carried out to find out the food consumption pattern of child for 3 consecutive days using recall method (Chapter No.-7). Mental development in terms of I.Q. is assessed by using "Draw-A-Man test" developed by Mishra for National Psychological corporation. These results are compared with anthropometric measurements and socio-economic survey (Chapter No.-8). The method of selection of school and children is given in detail in the Chapter No.-2.