A COMPARATIVE STUDY OF THE PHYSICAL GROWTH AMONG EGYPTIAN CHILDREN (6-7 years) IN TWO DIFFERENT SOCIO-ECONOMIC LEVELS

THESIS

Submitted in Partial Fulfilment for the Master Degree in Childhood Studies

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1987

ACKNOWLEDGEMENT

I would like to express my deepest gratitude, my sincerest thanks and my appreciation to ***Professor Dr. DIAIY M. HUSSEIN,*** *Professor of Paediatric, Military Medical Academy, for his true assistance, continuous encouragement and generous support throughout the course of this work.*

I would also like to express my supreme gratitude and my honest respect to ***Professor Dr. SAADIAI M. BAHADER,*** *Associate Professor of Developmental Psychology, Ain Shams University for her marvelous attitude in guiding me and her kind supervision.*

CONTENTS

INTRODUCTION

The characterstics of children, which most clearly distinguish them from adults, are that they are growing. Adults are not growing except perhaps in girth, and most of them are degenerating (Meadow and Smithells, 1981). The growth of an individual results from the interaction of his genetic potential and environmental factors in which the individual lives. Socio-economic factors are of great importance in determining the physical status of children (Eveleth and Tanner, 1976).

Socio-economic conditions may affect many aspects of life such as cultural concepts, dietary habits, food consumption and ability to purchase quantity and quality of the diet.

This work is an attempt to shed light on the effect of socio-economic status on the physical growth of children, through an epidemiological field-work, done among school children aged 6-8 years and taken from two different socio-economic classes.

CHAPTER : I

- Importance of The Present Study
- Aim of The Study
- Statement of The Study Problem
- Hypothesis of The Study

Importance of the Present Study:

The importance of the present study has arisen from considering the following;

1. In developing countries, such as Egypt, children of school age (5-18 years) constitute about one-third of the population.

2. Significant physical changes characterize the growth of the school-age child.

3. Proper growth and development of children is above and beyond the most important procedures of treating illness and preventing diseases. To support this, studies concerning the factors affecting growth and development of school-children are urgently needed.

4. Physical growth of children is the product of the accumulated effects of hereditary and environmental factors acting since conception. Any study of the reasons for the differences in physical growth among children of the same age group involves an examination of one or more of these factors.

5. Socio-economic factors are the most important environmental factors affecting physical growth of school-aged children, since other environmental and hereditary factors affect growth significantly

during the first year of life.

For these reasons, our thoughts and efforts are directed during this study to determine the effect of socio-economic factors on physical growth of children aged 6-8 years.

Aim of the Study :

Children are more vulnarable to different factors which affect their growth and health. Although the role of each of these factors differs according to the stage of growth, yet socio-economic factors appear to have their role throughout childhood-period.

The aim of this study is to find out the effect of the socio-economic status on the physical growth-measurements among Egyptian school children aged 6,7 and 8 years and taken from two different socio-economic classes.

Statement of the Study Problem:

The problem of this study can be stated in the following question:

Are there differences in the physical growth-measurements between children of two different socio-economic classes?

Hypothesis of the Study:

There are significant differences in the physical growth-measurements between the children of the two different socio-economic classes in favor of the upper one.

CHAPTER : II

REVIEW OF LITERATURE

Definitions of Terminology:

Growth: Denotes change in size resulting from increase in the number or size of the cells of the body (Abbassy et al., 1972).

Development: Is an over all increase in range, complexity and integration of individualized characterstics (Bahader, 1984).

The development and growth are continuous dynamic processes occuring from conception to maturity and taking place in an orderly sequence which is approximately the same for all individuals (Silver, 1980).

Physical growth is not just a change in size, it is also a change in proportions, structure and function, which often go together (Apley, 1979). Changes in function range from the molecular level such as activation of enzymes to complex inter-play of various organs in the metabolic and physical changes (Nelson, 1983).

Maturity Gradient:

It is known that all parts of the body do not grow at the same absolute rate but most parts grow at a decreasing rate in the 1st year with a few more years of gradual deceleration until the adolescent spurt occurs (Marshall, 1977).

Through the whole growth process, some regions of the body grow more quickly than others. Broadly speaking, the head is much more advanced in progress towards its adult size than the trunk, while the shoulder girdle is nearer its adult size at any given time than is the pelvic girdle. This phenomenon has been described as a cranio-caudal "maturity gradient". During childhood, the maturity gradient in the limbs runs from the distal to the proximal end so that the foot is nearer its adult size at any given age than the leg which in turn is more advanced in growth than the thigh. A similar situation exists in the upper limb (Marshall, 1977).

Individuality of Growth and Development:

No single schedule can be anticipated for any one child. First, there is a difference between the sexes; secondly in the same sex there can be considerable variation within normal limits, finally, various organ systems and functions within the individual reach maturity at different times.

This concept of individuality has gained great impetus resulting in the use of graphs and charts on which each child establishes his own pattern of development. However, the concept of the usual range or distribution of physical, mental or physiologic attributes is important and it is desirable to compare each measurement of the child under observation with his distribution

rather than with any single norm. Obtaining and interpreting each measurement improves clinical judgement and may bring to one's attention characteristics which might otherwise be overlooked (Lowrey, 1978).

Sex Differences in Growth:

At birth and during early childhood, boys are slightly taller and heavier than girls. Girls exceed boys in stature between about 10 and 13 years because of the earlier occurance of preadolescent spurt in girls (Barnett and Einhorn, 1968). Boys are usually larger than girls by only 1-3 percent in most body measurements before puberty (Tanner, 1978). Not all measurements follow this pattern: e.g. at all ages, boys exceed girls in chest circumference, girls exceed boys in thigh circumference and boys exceed girls in skeletal maturity and muscular development (Barnett and Einhorn, 1968).

Physical Growth During Early School Years:

The early school years are a period of relatively steady growth ending in a preadolescent growth spurt by about the age of 10 years in girls and about 12 years in boys. At the start of this period, the brain and the head size are nearly 90% of the adult size, height is about two-thirds and weight only one-third of the ultimate full growth. The average gain in weight during these years is about 3-3.5 kg/year and in height approximately 6 cm/year. Growth in head circumference is slowed

as it is only increased from about 51 cm to 53-54 cm. between the ages of 5-12 years (Nelson, 1983).

Factors Influencing Growth and Development:

The individual pattern of growth and development of any given child is determined by an interplay of hereditary and environmental factors (Wasserman and Slobady, 1974). From the time of conception until death, each phase of growth is influenced by the interplay of the inherited genes and the many environmental factors whose roles begin at fertilization (Lowrey, 1978).

A number of extrinsic and intrinsic factors influence the rate of growth. Socio-economic, nutritional status, seasonal, psychological, hormonal factors and diseases as well as activity are the most important extrinsic factors. While intrinsic factors include racial, sexual and genetic factors (Wasserman and Slobady, 1974).

l) Genetic Factors:

The growth is fundamentally a polygenic determination. The body size and growth rate are influenced by many genes on different loci acting independently of each other (Robson, 1978) and each one of them has a small effect (Tanner, 1984).

Hereditary affects not only the end result of growth, but also the rate of progress towards it. The radiological, dental, sexual and nourological ages of identical twins tend also to be identical, whereas those of non-identical twins may differ considerably (Sinclair, 1975). Also, there exists a fairly high correlation with regard to stature and weight of sibilings and there is evidence that rates of growth are more alike among sibilings than among non-related individuals (Flynt, 1973).

The genetic control operates throughout the whole period of growth (Brandt, 1984). However, genes have an age-limited effect. Not all of them are active at birth, but some manifest their effect at the latter years of growth (Carter and Marshal, 1978).

The genetic factors influence the response of end organs to all sorts of stimuli, for example, hormones; nutrients and external environment (Lowrey, 1978).

Genetic factors which are sometimes thought of as establishing final limits to biologic potentials are interwoven with the environmental factors (Vaughan, 1982). Korean school children in Japan were slightly taller at every age and in early adolescence, they were lighter and more slender for a given height than the Japanese children living in the same environment (Kim, 1982).

Genetic factors probably play the leading part in the difference between male and female patterns of growth. This is attributed to the "Y" chromosome which exerts a retarding action on the skeletal maturation in boys (Sinclair, 1975).

2) Hormonal Factors:

Endocrinal glands have an important and definite effect upon the physical, mental and emotional growth and development of the child. Such effects are mediated through the hormones which act as regulating agents for various body functions (Abbassy et al., 1972).

It is suggested that there may be a growth center in the hypothalamus responsible for keeping the child on his genetically determined growth curve wherever possible, and the anterior lobe of pituitary gland interacts with this center by controlling hormones (Sinclair, 1975).

a. Growth Hormone: Somatotrophin:

It is generally accepted that the normal pulsed secretion of growth hormone occurs physiologically in response to sleep and to hypoglycaemia (Hamilton and Hussein, 1977).

Growth hormone is secreted from the anterior lobe of the pituitary gland. It does not act during intra-uterine life (Forsling and Nabrro, 1982). The primacy

of its action is in controlling the postnatal growth. It promotes growth of a variety of tissues including bone, soft tissue and viscera. This action is mediated through the somatomedins (Underwood and Kenan, 1981). Somatomedins are small peptides produced by a direct action of growth hormone on liver and perhaps kidney (Forsling and Nabrro, 1982). Somatomedins exert their pronounced growth promoting action on cartilage. This action involves stimulating the synthesis of carbohydrates and protein components of the chondroitin proteoglycan, the synthesis of collagen and the synthesis of R.N.A. and D.N.A. (Daughaday, 1981).

Children with growth hormone deficiency tend to be shorter, more likely to be obese, grow more slowly and more often are the products of an abnormal pregnancy (Vimpani et al., 1981).

In patients with growth hormone deficiency it was found that: Standing height, sitting height, subischial leg height were equally retarded, and bihumeral width was more retarded than iliac width. The head was relatively large, fat tissue was increased with subscapular skin folds being greater than triceps skin-folds, indicating relative obesity of the trunk muscle and/or bone mass was reduced. It is concluded that anthropometric measurements may help in differentiating this type of growth hormone deficiency (Zachmann et al., 1980).

B. Thyroid Hormones:

The thyroid hormones are important for normal post-natal somatic growth (Underwood and Kenan, 1981). They are essential for the stimulation of general metabolism particularly that of brain, bone and teeth (Sinclair, 1975).

In both the neonatal and childhood periods, hypothyroidism seriously impairs growth. During hypothyroidism, growth of the epiphyseal cartilage is reduced in width and exhibits ultrastructural abnormalities in chondrocytes, enhanced glycogen deposition and premature calcification of the matrix (Silver, 1980).

C. Insulin

It is an anabolic hormone, it promotes the synthesis of protein, lipid and glycogen and inhibits their degeneration. It promotes cell growth in many different cell types and is an absolute requirement for normal growth (Holt and Smith, 1982).

D. Androgens and Estrogens:

Testosterone and other androgens are anabolic hormones that stimulate cell growth and multiplication. They tend to increase body weight in addition to their effect on development of secondary sexual changes in males (Hall et al., 1974).

Both androgens and estrogens stimulate linear growth, but because they enhance bone maturation and epiphyseal fusion, excessive secretion will ultimately lead to short stature (Hall et al., 1974).

E. Parathyroid Hormones:

The main effects of parathormone and calcitonin of the parathyroid glands are related to the development of bones (Sinclair, 1975).

3. Socio-economic factors:

Socio-economic factors are of great importance in determining the physical status of children (Eveleth and Tanner, 1976). The upper socio-economic class children are larger in body size at all ages (Tanner, 1977 and Kerr et al., 1982).

The socio-economic status includes home conditions, food expenditure, crowding, mother's age,father's occupation, birth interval between children and income. However, difference in mother care domestic and cultural capabilities produce wide differences in growth in families with similar income group (Lowrey, 1978). The growth differences are more related to home conditions than to economic conditions. However, nutrition is the most important cause of socio-economic differences (Sinclair 1975; Lowrey, 1978 and Tanner, 1984).

Areas of family dwelling, persons per bed-rooms and persons per bed, all show highly significant relationships with physical growth of children, the greater the crowding, the lower incidence of normal physical growth (Tanner, 1984).

The economic factor is less important than the social factor in a home where sleep and exercise are sufficient and where the children are taught the basic rules of health (Sinclair, 1975).

Sanitary conditions of the household appear to affect physical growth. A greater incidence of infectious diseases seems to be influenced by poor sanitary conditions, and crowded sleeping facilities (Cravioto et al., 1975).

There is a great association between the number of children in the family and their weights and heights. The more mouths to feed, or simply children to look after, the slower the children grow (Tanner, 1978). The effect of family size on physical growth of children is attributed by some to the less individual care and attention in large families (Sinclair, 1975). Also family size probably affects the children's physical growth by influencing the incidence of infectious disease and dietary intake.

Christiansen et al.,(1975) reported that parents with higher level of newspaper reading have a significantly higher percentage of children with normal weight and height.

The economic factor seems to be less important than the social factors as food habits, sleeping conditions and exercises (Sinclair, 1975).

Tanner,(1977) found that both nutrition and other conditions in the home are largely dependent on the intelligence and education of the parents especially the mother, rather than their economic circumstances unless these are extremely poor.

4. Nutritional Factors:

Nutrition in childhood differs from nutrition in adulthood because all nutrients must provide not only energy and replacement of tissues but also essential elements needed for growth (McLaren and Burman, 1976).

Normal growth involves the ordered deposition of protein in the body. Growth requires adequacy of both dietary substrate (exogenous nutrition) and hormone directed utilization of metabolic fuel (endogenous nutrition) (Kerr et al., 1982).

Natural lactation is better for growth than the artificial type. In a study conducted among low

socio-economic class in Egypt, it was found that the weight of breast fed infants coincided with the standard values in first and second months, and then it gradually decreased, while the artificially fed had a lower value,and mixed fed infants occupied an intermediate position (Emam, 1978).

Children subjected to under nutrition are shorter and less in weight than their well nourished peers. The rate of gain in weight is more affected than the gain in height, but if the nutritional deficit is severe enough and continues long enough, linear growth will be retarded or may even cease (Sinclair, 1975).

Physical growth of the Boia-Fria (Southern Brazil) children are significantly lower than their well-to-do counterparts. It is suggested that the poor anthropometric measurements of the Boia-Fria children were a reflection of poor dietary habits (Desai et al., 1981). With malnutrition, the appearance of centers of bone ossification is delayed (Toews and Lee, 1975).

Caloric defficiency or low protein in diet may result in decreased growth rate and ultimately in stunted growth (Kerr et al., 1982). Not only protein and calory supply, but also other factors are essential for normal growth. Iodine is needed for the manufacture of thyroid hormone, calcium; phosphorus;magnesium

and manganese are essential for proper bone growth. Iron is required for haemoglobin and flourine is needed for the proper formation of tooth enemal. Vitamine D. deficiency is a cause of rickets (Sinclair, 1975).

5. *Diseases and Parasitic Infestation:*

Children born with a congenital caridac defect, of whatever sort, may, if the disturbance is severe enough, show a stunting and retardation of growth (Sinclair, 1975). Chronic diseases such as malnutrition, chronic infections, T.B., and heavy parasitic infestation produce also growth retardation (Abbassy et al., 1972). Other most common chronic diseases associated with stunted growth are chronic asthmatic bronchitis (Martin et al., 1981) and chronic serious renal disease (Hodson et al., 1983).

Parasitic infestations usually affect both the nutritional conditions and haematological pattern of host (El-Bagori, 1984). Parasites may produce circulatory toxins with possible effects upon the endocrines as pituitary, thyroid, adrenals and gonads. This might lead to weight loss, dwarfism, longer span than height, longer lower body segment than upper body segment and more retarded onset of puberty (Tadros, 1973).

Acute illnesses such as measles, influenza, pneumonia ... ect. cause no retardation of growth in well nourished children but have an effect on ill nourished ones (Tanner, 1977).

6. Secular Trend:

During the past century, there have been profound changes in the range of maturation which resulted in greater increments of growth. The cause is said to be the consequence of a decrease in growth inhibiting factors such as poor nutrition and chronic disease (Wolanski, 1984).

A rough rule for preschool children is that the average secular gain in size has been about 1.3 cm in height and 0.5 kg in weight for each decade. In adolescents the gain has been about 2.5 cm and 2.3 kg for each decade (Sinclair, 1975). In most well-off communities this trend has stopped, perhaps these children are fulfilling their genetic potential. There is no evidence of slowing or stop of this phenomenon in developing countries (Tanner, 1977).

7. Exercises

Some longitudinal studies have examined the effect of exercises on growth of children. Exercises reduce the storage of depot fat and consequentally may alter

the shape of the body. They also cause an increase in size of muscle fibers and not in its number (Sinclair, 1975 and Mirwald et al., 1981).

There are marked differences of the anthropometric status of school boy gymnasts from the standard percentile values. This is most evident in the gymnast's high biacromial diameters and low skin-fold measurements (Buckler and Brodie, 1977).

8. Race:

There are racial differences in rate and pattern of growth, leading to the racial differences seen in adult's body-built. Some of these are clearly genetically controlled, whereas others depend on climate and nutritional factors (McCaffey et al., 1970 and Tanner, 1977).

American Negro neonates, initially smaller than white ones, grow more rapidly and from the second year of life to adolescence tend to be taller (Garn and Clark, 1975). The yellow (Asciatic) child, tend to be smaller than either the black or white child (Barr et al., 1972). Also black boys and girls have earlier ossiffication timing (Garn et al., 1973).

9. Psychological Factors:

Severe emotional disturbances may result in marked growth retardation. Removal of the child from this environment may result in the occurance of a striking catch-up growth (Frasier and Rallison, 1972). It has been found that parents who want their children to be skilled workers and to attend high school have a much higher percentage of children with normal weight and height than parents with lower aspiration for their children (Christiansen et al., 1975).

There was an experiment done on two similar orphanges having the same diet and supplements, living under the same environmental conditions but differing in their supervisors. The children who had unpleasant supervisors showed slow growth rate than their fellows. When stress conditions were omitted, catch-up growth occured (Lowrey, 1978).

10. Season, Climate and Altitude:

A. Season:

Seasonal variation in the rate of growth have been observed. Growth in height is faster in the spring than in autumn by a factor of 2-2.5 times. On the contrary, growth in weight proceeds faster in the autumn than that in spring (Tanner, 1977). It is

4-5 times in autumn than that in spring (Sinclair, 1975). The factor behind the seasonal variation is not yet known, but it may have a hormonal basis (Tanner, 1977 and Sinclair, 1975).

B. Climate:

It has been suggested that each major race of mankind varies in stature according to the climate in which they live (Sinclair, 1975). Exposure to high temperature during the growth period leads to morphological changes which confer higher resistance to heat stress and lead to a linear morphology (tall with long legs and narrow shoulder and thorax) as a result of pecular adaptive evolution (Hiernaux, 1964). The adult's weight for height is affected by the mean annual temperature (Tanner, 1977).

C. Altitude:

At comparable ages, high altitude residents were shorter, lighter and linear but with more expansive and rounded chest than sea level controls. These results suggest that altitude confers allometric growth changes (Mueller et al., 1978). Bolivian children who had lived all their lives at high altitude were found to be smaller in terms of general body size than those who had spent the shortest amount of time at high altitude (Stinson, 1982).

All the above mentioned factors which affect growth are intermingled and act together to give the final size and shape of the individual. But it is apparent that the most important factors which affect growth are genetic, hormonal, socio-economic and nutritional factors.

GROWTH INDICATORS

Growth assessment appears to be of great value as it detects deviation from the usual growth pattern characterstic of the growing period (Jelliffe, 1971). The most common and useful measurements required for school children are weight, height, arm, chest and head circumferences (Jelliffe, 1966). These measurements are the simplest, quickest and easiet body measurements and they give maximal information concerning the growth state (Sinclair, 1975).

l. Height:

The accurate measurement of crown-heel length provides the best clinical measure of skeletal growth since, unlike weight gain, it is not influenced by the accumulation of water and fat (Babson and Bramhall, 1969).

As regards the height, there are only three components to be considered, the bones, the cartilages and a limited amount of connective tissue and skin. On the other hand, every tissue and organ in the body is involved, regarding the case of weight (Sinclair, 1975). Height depends to a considerable extent on the width of the intervertebral discs of the vertebral

column, and this is compressed by the gravitational strain imposed by the upper part of the body as the day goes on, with the result that height is less in the evening than in the morning by about 2 cm. Height is also affected by the tension of the muscles which control the posture of the pelvis and vertebral column, if the muscles are weakened, the height of the individual may alter (Sinclair, 1975).

Growth in height, like all other human measurements is not uniform throughout life. The maximum rate of growth occurs before birth, in the fourth month of fetal life where it is 1.5 cm per day. The birth length is around 50 cm, at the end of the first year, the body increases by about 50% to reach 75 cm. In the second year another 12-13 cm are added. Thereafter, growth in height settles down to a rate of 5-6 cm every year (Sinclair, 1975). During the early school years, the average annual gain is 5 cm or little more. About the 13th year the birth length has tripled (Lowrey, 1978). The adolescent spurt begins about the age of 10-11 years in girls and 11-13 years in boys. In both sexes, it lasts for 2-2.5 years. During the spurt, boys add about 20 cm to their height, mostly because of growth of the trunk, while girls add about 16 cm. Because the spurt begins earlier in females,

there is an age at which girls become taller and heavier than boys of the same age. The balance is re-gained by the age of 14 when boys overtake girls in height, though they do not become heavier until sometime later (Sinclair, 1975).

2. Weight:

Weight is still the most widely used single clinical measurement of growth. This is because of the relative ease of its measurement. Weight can be regarded as the sum of body fat and lean body tissues so that weight gain must represent the sum of increments of different body components including muscle, skeleton, adipose tissue and water. It is therefore, a non specific measurement of growth (Davis and Dobbing, 1981).

Since a large percentage of body weight is due to the water content, the body weight is considerably affected by the state of tissue hydration, this in turn depends on many different influences. Other variables in the measurement of weight include the intake of meals, the amount of urine in the bladder and the amount of faeces in the intestine (Sinclair, 1975).

The full term body weight is about 3-3.5 kg at birth. The infant doubles its weight by about 5th

month and triples it by the end of the first year (Vaughan, 1982). By the end of the second year, the weight is quadrupled. After this it settles down to a relatively steady annual increase (Sinclair, 1975). The approximate annual increment in weight after the second year is about 2-3 kg per year, until individual begins his adolescent growth spurt. During the spurt, boys may add 20 kg and girls 16 kg to their weights (Lowrey, 1978).

The typical girl's weight is less than that of the boy at birth. It equals him at the age of 8, becomes heavier at the age of 9 or 10 and remains so till about the age of 14 (Garn and Clark, 1975).

3. Head Circumference:

One of the most important measurements in the evaluation of children is the circumference of the head. It is a measurement having a relatively narrow range for any group with a standard deviation that remains small and nearly constant for the entire growing period (Lowrey, 1978). There is almost no variation based on racial, national or geographic factors (Naeye et al., 1971). Although head circumference has been shown to correlate well with intracranial volume and brain weight (Fancourt et al., 1976), there is no simple

relationship between head circumference growth and brain growth (Dobbing and Sands, 1978).

Head growth is very rapid during the early months of life, and then there is deceleration. There is a 5 cm increase in the first four months, a second increase of 5 cm is achieved by the end of the first year. From then until the age of 18, there is only another 10 cm increase. The slight but definite increase which occurs during adolescence and early adult life reflects a greater thickness of cranium and cutaneous tissues rather than any change in brain size (Lowrey, 1978).

Although there is a slight difference between the sexes, the circumference of males being greater, the difference does not exceed 1 cm for the mean at any age (Tanner, 1984).

Head circumference is affected by nutrition. Comparative study of head circumference showed that the mean head circumference was significantly reduced in all types of protein energy malnutrition. The size of reduction was related to the percent standard body weight irrespective of type of malnutrition present (El-Behairy et al., 1977).

4. *Arm Circumference*

Arm circumference appears to be a good index of muscle mass and indirectly therefore of protein intake. So a healthy child will have thick arms and greater arm circumference, while a thin malnourished child will have thin arms and smaller arm circumference (Goodhart and Shills, 1973). At birth a healthy child has an arm circumference of 10.5 cm and reaches by the end of the first year about 16 cm and reaches to about 17 cm at 5 years. After that a slow steady increase occurs (King et al., 1976).

5. *Chest circumference:*

At birth the chest circumference is ½ - 1 inch less than the circumference of the head. The antero-posterior and transverse diameters of the chest are about equal at birth producing circular shape of the chest in normal newborn infants. After one year, the chest circumference exceeds that of the head and the shape of the chest alters because of the greater increase in the transverse diameter (Hughes, 1975).

The mean values of the chest circumference are found to be: at birth 35 cm, at 6 months 44 cm, at 1 year 47 cm, at 6 years 56 cm, at 9 years 60 cm at 12 years 66 cm and at 20 years 86 cm (Nelson, 1983).

GROWTH CURVES

Growth curves are constructed to fit and summarize human growth data. Fitting a curve to the individual values is the only way of extracting the maximum information for an individual measurements. Growth curves are based on either cross-sectional data or longitudinal data. The cross-sectional curves are those in which various individuals at different ages are measured. These should be used to ascertain the position of an individual at a given age in relation to the general population, while the longitudinal curves are used in studying individual children over a period of time (Rimoin and William, 1978).

There are four types of growth curves:

1. Distance curves:

It represents the size attained at each age. It shows the three phases of: rapid growth of the infant, gradual decelerating growth of prepubertal child and the growth spurt of adolescence (Tanner, 1984).

2. Velocity Curves:

Growth can be assessed in terms of increments in height per unit time. These curves emphasize significant deviations from the average for age. The

changes in growth rate at different age periods are illustrated clearly (Falkher, 1977).

3. Centile Curves:

It describes the distribution of a characterstic in a population. For example, the height can be expressed in terms of percentiles for chronological age from the third to the ninety seventh percentiles. The $50^{\underline{th}}$ percentile level represents the average or median height for a certain age and this means that the height of 50% of normal children in this age falls below this level (Sinclair, 1975).

4. Standard Deviation Curves:

It is used to show the degree of dispersion of observations around the mean. Mean $\pm$ 1 S.D. includes about 67% of the total number of observations, while mean $\pm$ 2 S.D. includes about 95% of it (Sinclair, 1975).

RELATED RESEARCH

A number of works handled this subject from some aspects. In the following paragraphs, I shall concisely mention the important ones of them.

Dewey et al. (1983) found that the rate of growth in height and weight of Mexican children during their summer residence in The United States was accelerated indicating that the adequate growth status of these children might be related to the improved social conditions for growth in The United States.

Tanner (1978) found that at adolescence, children of high socio-economic class were taller than those of lower socio-economic class but the latters were heavier and he explained that because of their diet which depended mainly on carbohydrates.

Sinclair (1975) gave the same difference in height between children of high and low socio-economic classes, but in contrast to Tanner's results, he found that children of high socio-economic class were heavier than those of lower one.

Spurr et al. (1983) stated that "Not only weight and height are influenced by socio-economic class but

also other anthropometric measurements, for example: skin fold thickness, mid arm circumference, head circumference and sexual maturation".

Grahnen and Arvidsson (1971) found that the socio-economic conditions especially the educational level of the parents were correlated to the frequency of the children's consumption of various food and the latter was correlated to certain medical and anthropometric differences.

The importance of maternal educational factor on the growth of children was studied by Graham, (1972) who found that the mean height of children whose mothers had completed a minimum of 5 years of school was significantly higher than that of children whose mothers had not completed.

In a study on urbanization and its implications, Johnstone et al. (1978) found that the urban natives were taller, heavier, with thicker skinfolds and of greater weights for heights than the rural ones.

Abramson and Ernest (1954) found a considerable relationship between social class (in terms of father's occupation) and growth of the child, while the association between the parents' actual net income and

growth rate of children was absent. Tanner (1978) stated that "In most European groups, the chief difference is between those whose fathers are in occupations classified as manual (working) and non-manual (intellectual). In developing countries, the differences occur in relation to father's or mother's educational status".

Thomas (1945) found that children of families who lived in a single room were on the average smaller and lighter than those of families who occupied two rooms and the latters were smaller than those of three-room families and so on. Graham (1972) also found that there was a suggestive drop in height of the children in those homes with more than four persons per bed indicating extreme poverty and poor hygiene.

Bransby et al. (1946) found that the increase in the number of children in the family and worse home conditions were associated with a reduced rate of growth and state of health. Also the data of Scottish Survey (1947) showed a fairly strong relation between family size and anthropometric measurements of the children. Christiansen et al. (1975) found that the percentage of children with normal weight and height droped considerably in families with six or more children.

Recently a number of Egyptian works have been done to study the effect of socio-economic level on the physical growth of the children.

Rezkallah (1980) found that the socio-economic status had an influence on physical growth of children since the mean values of weight, height and haemoglobin concentration of the upper socio-economic group were greater than those of the lower group.

El-Hadidy (1985) found that the rates of growth in height, weight and head circumference among Egyptian infants, taken from upper socio-economic standard, were markedly accelerated than those taken from lower standard. She attributed her results to style of living, cultural believes, dietary habits, prevalence of infection and attitude of the family towards the infant.

CHAPTER : III

PROCEDURE AND METHOD

A cross-sectional study was carried out to show the effect of socio-economic factors on the physical growth of the Egyptian children aged 6,7 and 8 years.

Sample of the Present Study

600 Egyptian children were the sample of our study. They were selected equally from both sexes and from each of the above mentioned ages. These children were also equally taken from two different socio-economic classes. The first group was taken from private primary schools at Zamalek district to represent the higher socio-economic sample. These private schools were El-Gizira Language school and Port-Said Language school. The second group was taken from government-run schools at Ramelet Boulak district to represent the lower socio-economic sample. These government run schools were: Ramelet Boulak primary school and El-Naser primary school.

According to these, the sample was distributed as follows:

Age	Upper socio-economic class		Lower socio-economic class	
	boys	girls	boys	girls
5½ - 6½ year	50	50	50	50
6½ - 7½ year	50	50	50	50
7½ - 8½ year	50	50	50	50
	150	150	150	150

For every school, I took the principal's permission after accounting for my visit and what was going to be done.

The following procedures were carried out for every child: (see appendix)

1. Personal data:
   - Name
   - Age
   - Sex
   - School form
   - Adress and district

2. Socio-economic format:

	Score
1. Education of mother	
- University graduate or more	3
- Secondary school graduate (general or technical).	2
- Did not complete primary school.	1
2. Occupation and education of father:	
- Government employee and or university graduate.	3
- Skilled laboure and or secondary school graduate.	2
- Manual worker and or did not complete primary school.	1
3. Family size:	
- One or two children	3
- Three or four children	2
- More than four children	1
4. Family Income:	
- More than 200 Egyptian pounds/month	3
- More than 100 Egyptian pounds/month	2
- Less than 100 Egyptian pounds/month	1

5. Crowding of dwelling and sleeping conditions:

   - One or two persons/bed room 3
   - Three or four persons/bed room 2
   - More than four persons/bed room 1

Those children who took more than 10 marks were considered as higher socio-economic class while those who took 10 marks or less were considered as lower socio-economic class.

This format was useful in the sense of confirming the selection of the sample. It was designed by the assistance of a panel of pro fessors of sociology at Ain Shams University.

This format was filled in by the help of the social worker, the form teacher and the pupil himself.

3. Clinical Examination:

Accurate and complete clinical examination was done for every child including:

1. General examination
2. Heart examination.
3. Chest examination.
4. Abdomen examination

Pupils having skeletal deformities or abnormal physical growth and chronic heart or chest diseases were excluded as these may affect the results of our work.

4. Anthropometric measurements:

including:
- Height
- Weight
- Arm-circumference
- Chest-circumference

N.B.: Head circumference was excluded because of having small narrow range for any group and nearly constant for the entire growing period (Lowrey, 1978).

The landmarks and techniques used for measurement of weight, height, arm and chest circumferences were those recommended by Jelliffe (1966).

Every child was called for, then asked to remove the shoes and to take off as much as possible of his clothes.

l. Height

Measured by using a graduated wooden measure with a fixed transverse perpendicular piece on which

the child stand, and another movable one touching the crown. The child was asked to stand straight, so his heels, scapulae and buttocks were in contact with the wooden vertical stand of the measure. The child's head was positioned so that the lower borders of the orbits were in the same horizontal plane as the external auditory meati (Frankfurt plane), and gentile upward pressure was exerted on the mastoid processes (Jelliffe (1966) and Marshall (1977)). The standing height was recorded to the nearest half centimeter.

2. *Weight:*

Weight was measured with minimum indoor clothing without shoes to the nearest half kilogram by the use of the spring type balance (Jelliffe, 1966).

3. *Chest circumference:*

Measurement of chest circumference was made in mid-respiration, at the level of the xiphoid cartilage (substernal notch), in a plane at right angles to the vertebral column while the child was standing (Nelson, 1983).

4. *Arm circumference:*

Measured at a level midway between acromion and olecranon processes using steel tape which must be

placed gentely but firmly around the arm to prevent compression of soft tissues. The right arm was usually measured except in left handed pupils, the left arm was measured. The measured arm was suspended and relaxed beside the body during measurement (Jelliffe, 1966).

Statistics:

Certain statistical measures were done including:

1. The mean: $\bar{X}$
2. The standard deviation: S.D.
3. T. test.

1) The mean $= \frac{\Sigma x}{n}$

Where

ΣX = sum of observations.

n = number of observations.

2) The standard deviation:

$$S.D. = \sqrt{\frac{n\Sigma x^2 - (\Sigma x)^2}{n\ (n-1)}}$$

Where:

S.D. = Standard deviation

n = Number of observations

Σx^2 = Sum of the squares of observations.

$(\Sigma x)^2$ = Square of the sum of observations.

3. T. test

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{SD_1}{n_1} + \frac{SD_2}{n_2}}}$$

Where

t = Test of significance between data of the two groups.

$\bar{x}_1$ = Mean of the first group.

SD_1 = Standard Deviation of the first group.

$\bar{x}_2$ = Mean of the second group.

SD_2 = Standard deviation of the second group

n_1 = Number of observations of the first group

n_2 = Number of observations of the second group.

Then value of t was recorded from its special table.

CHAPTER : IV

RESULTS

Table I.

Means and standard deviations of the boys' height according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	117.9	± 4.75	50	110.54	± 6	6.131***
7	50	123.52	± 5.65	50	116.74	± 6.4	5.556***
8	50	126.44	± 5.43	50	121.28	± 5.6	4.615***

*** Significant at level of 0.001

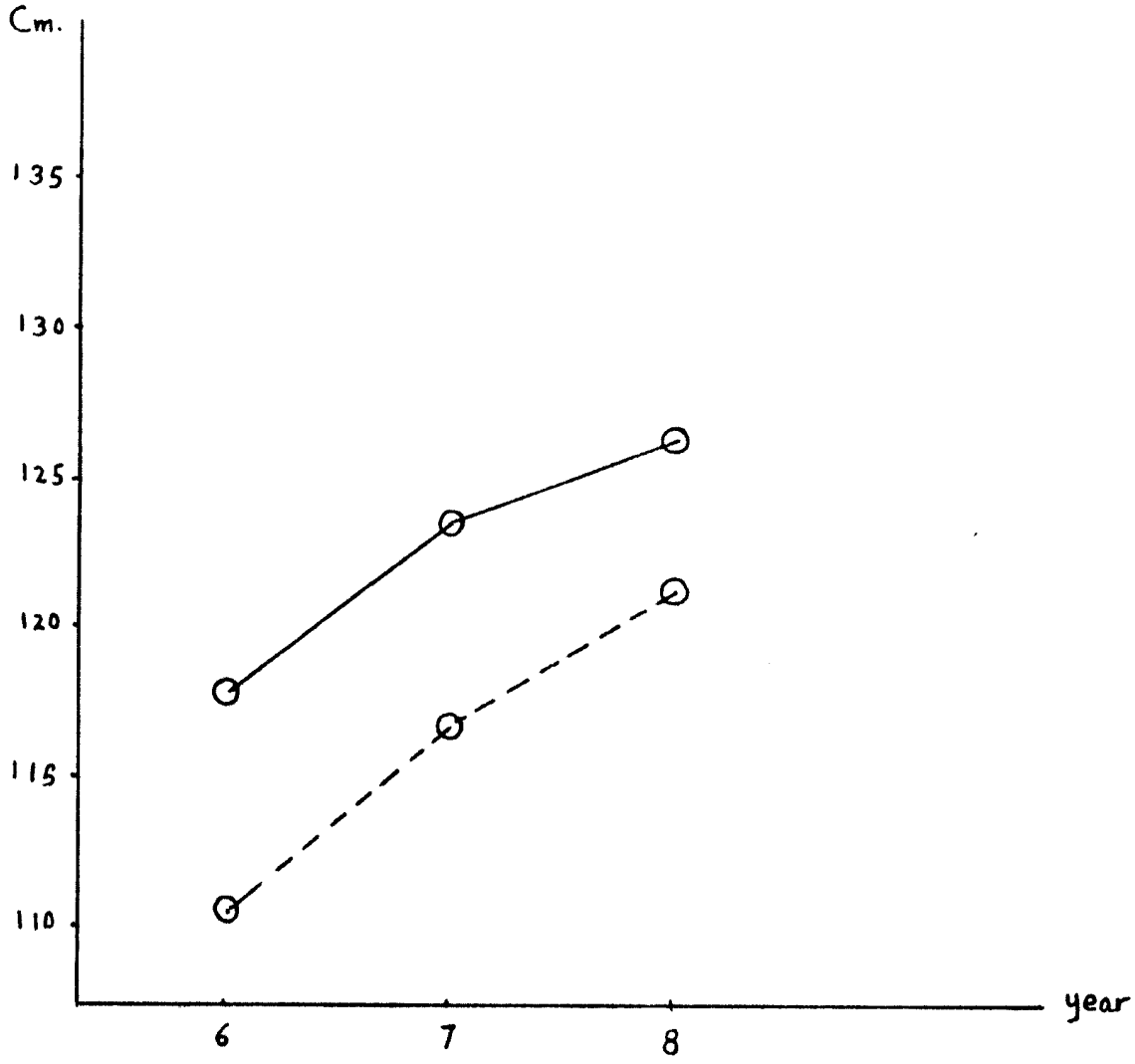

Fig. 1: *Means of the boys' height by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 1 gives the number of boys of the two classes at different ages and their mean heights with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean height of 50 boys taken from the upper class is 117.9 cm at 6 years, 123.52 cm at 7 years and 126.44 cm at 8 years; while those of the lower class are having a mean height of 110.54 cm at 6 years, 116.74 cm at 7 years and 121.28 cm at 8 years.

- There is a significant difference between means of boys' heights of the two classes at each of the different ages.

Figure 1. Shows the mean heights of boys of the two classes in relation with their ages.

Table 2.

Means and standard deviations of the girls' height according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	116.5	4.93	50	109.3	5.4	6.862***
7	50	119.54	4.92	50	115.72	5.57	3.601***
8	50	124.86	5.24	50	120.22	4.94	4.511***

*** Significant at level of 0.001

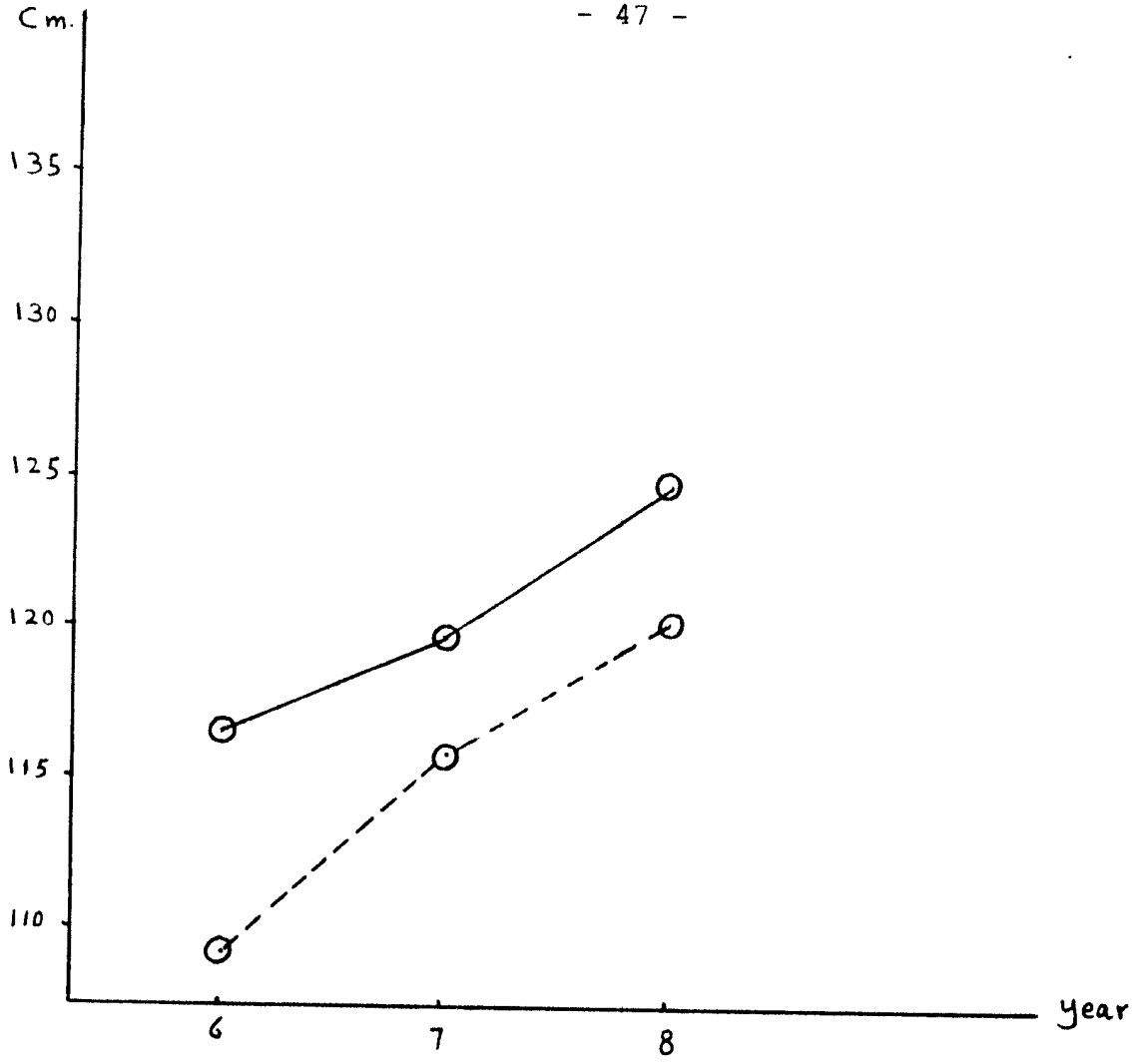

Fig. 2: *Means of the girls' height by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 2 gives the number of girls of the two classes at different ages and their mean heights with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean height of 50 girls taken from the upper class is 116.5 cm at 6 years, 119.54 cm at 7 years and 124.86 cm at 8 years; while those of the lower class are having a mean height of 109.3 cm at 6 years, 115.72 cm at 7 years and 120.22 cm at 8 years.

- There is a significant difference between means of girls' heights of the two classes at each of the different ages.

Figure 2 Shows the mean heights of girls of the two classes in relation with their ages.

Table 3.

Means and standard deviations of the boys' weight according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (kg)	S.D.	No	Mean (kg)	S.D.	
6	50	20.27	2.23	50	17.76	2.95	4.753***
7	50	21.68	3.33	50	20.48	3.0	1.875.
8	50	24.46	4.69	50	23.14	2.6	1.724.

*** Significant at the level of 0.001

. Non significant.

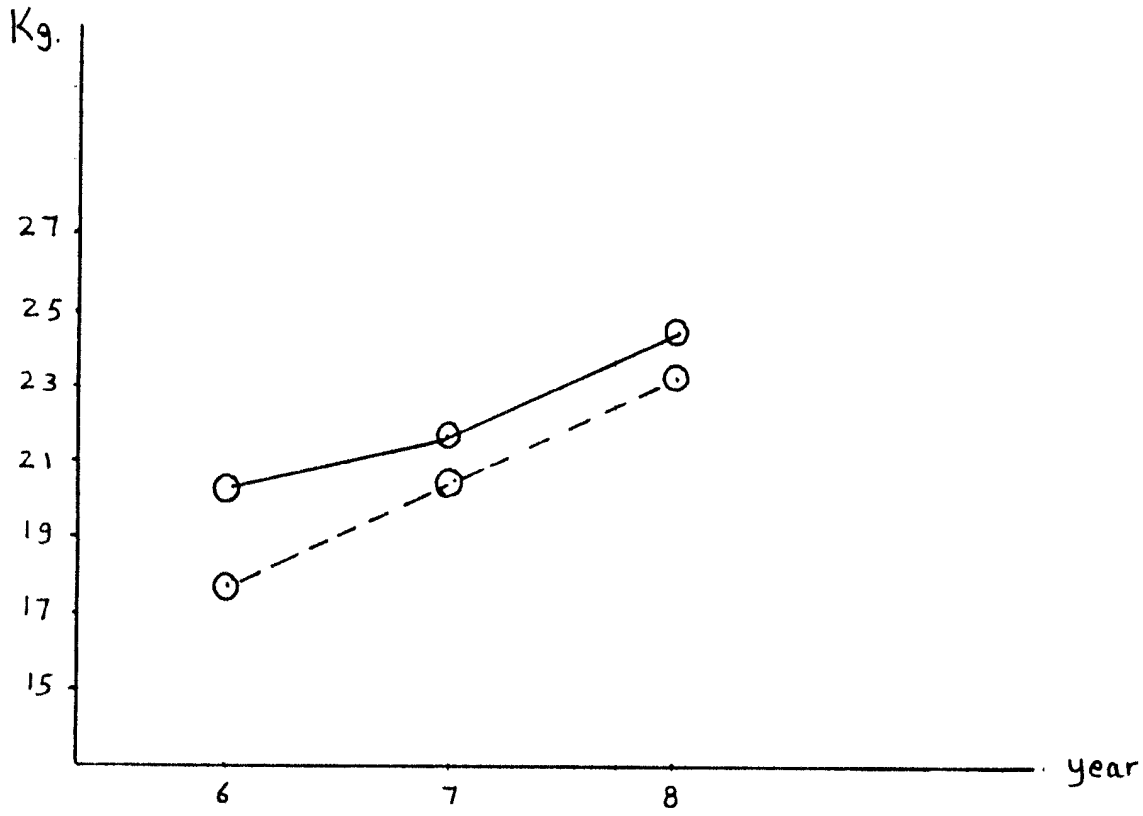

Fig. 3: *Means of the boys' weight by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 3 gives the number of boys of the two classes at different ages and their mean weights with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean weight of 50 boys of the upper class is 20.27 kg at 6 years, 21.68 kg at 7 years and 24.46 kg at 8 years; while those of the lower class are having a mean weight of 17.76kg at 6 years, 20.48 kg at 7 years and 23.14 kg. at 8 years.

- There is a significant difference between means of boys' weights of the two classes at 6 years old but there are no significant differences at 7, 8 years old.

Figure 3 Shows the mean weights of boys of the two classes in relation with their ages.

Table 4.

Means and standard deviations of the girls' weight according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (kg)	S.D.	No	Mean (kg)	S.D.	
6	50	19.44	3.52	50	17.4	2.88	3.139**
7	50	21.08	3.68	50	20.28	2.76	1.218·
8	50	23.95	3.44	50	22.82	3.25	1.671·

** Significant at level of 0.01

· Non significant.

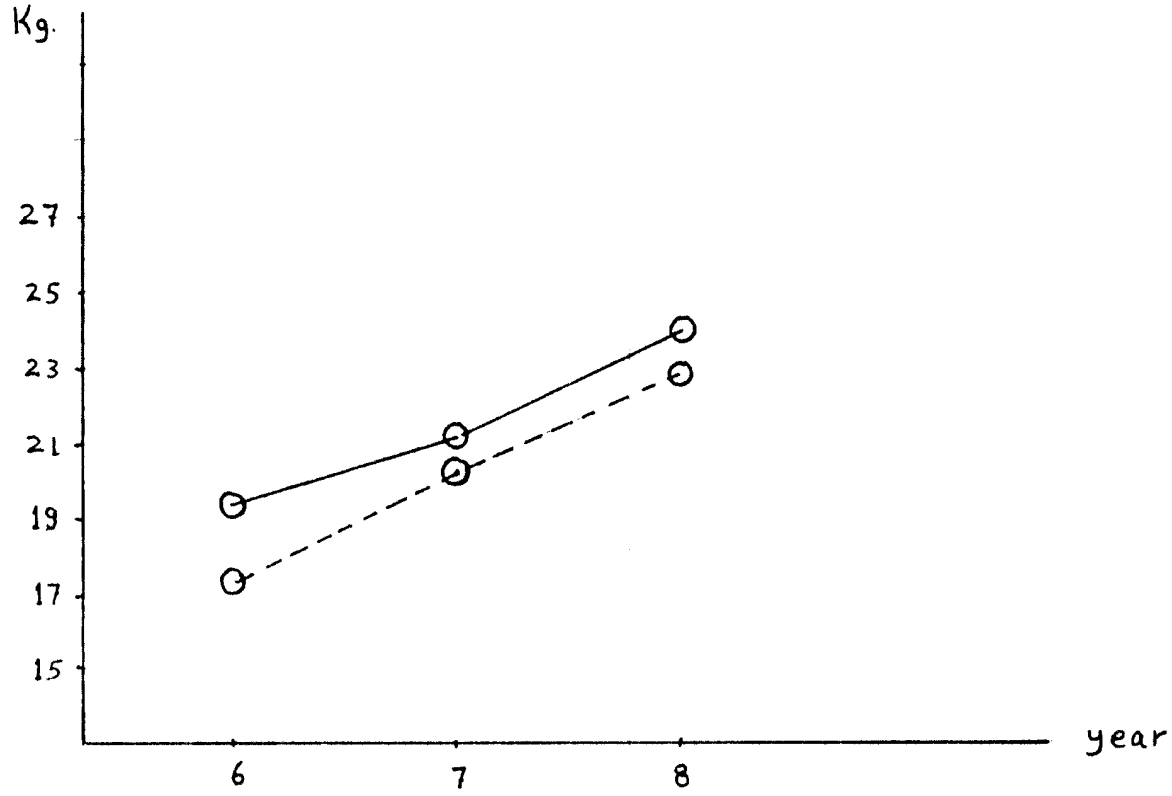

Fig. 4: *Means of the girls' weight by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 4 gives the number of girls of the two classes at different ages and their mean weights with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean weight of 50 girls taken from the upper class is 19.44 kg at 6 years, 21.08 kg at 7 years and 23.95 kg at 8 years; while those of the lower class are having a mean weight of 17.4 kg at 6 years, 20.28 kg at 7 years and 22.82 kg at 8 years.

- There is a significant difference between means of girls' weights of the two classes at 6 years old but there are no significant differences at 7, 8 years old.

Figure 4 Shows the mean weights of girls of the two classes in relation with their ages.

Table 5

Means and standard deviations of the boys' arm circumference according to their ages and socioeconomic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	17.12	2.14	50	15.68	2.23	3.26**
7	50	18.14	1.27	50	17.26	1.71	2.89**
8	50	19.1	2.03	50	17.8	1.47	3.63***

*** Significant at level of 0.001

** Significant at level of 0.01

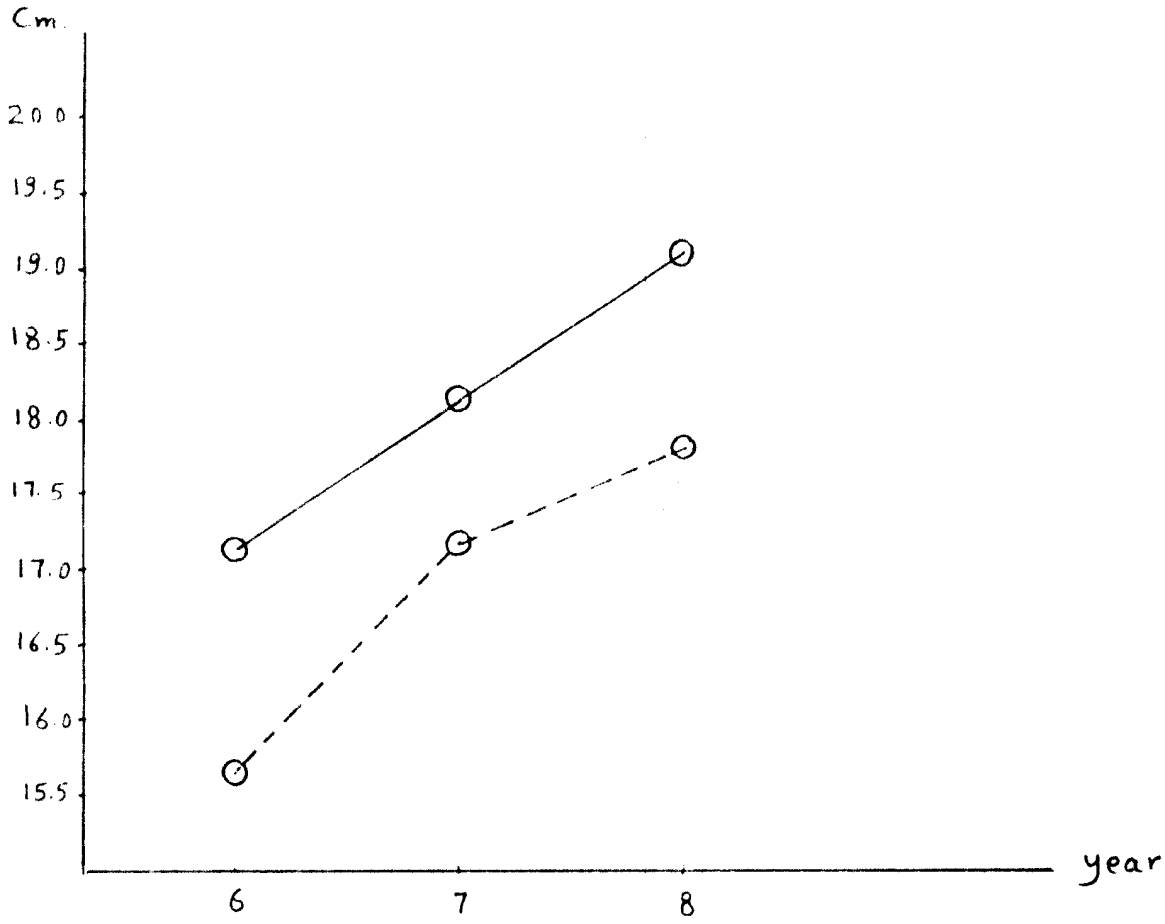

Fig. 5: *Means of the boys' arm circumference by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 5 gives the number of boys of the two classes at different ages and their mean arm-circumferences with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean arm-circumference of 50 boys of the upper class is 17.12 cm at 6 years, 18.14 cm. at 7 years and 19.1 cm at 8 years; while those of the lower class are having a mean arm-circumference of 15.68 cm at 6 years, 17.26 cm at 7 years and 17.8 at 8 years.

- There is a significant difference between means of boys' arm circumferences of the two classes at each of the different ages.

Figure 5 shows the mean arm circumferences of boys of the two classes in relation with their ages.

Table 6.

Means and standard deviations of the girls' arm circumference according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	17.48	2.79	50	15.76	1.65	3.72***
7	50	18.36	2.17	50	17.32	3.8	2.05.
8	50	19.92	1.99	50	18.62	1.44	3.71***

*** Significant at level of 0.001

. Non significant.

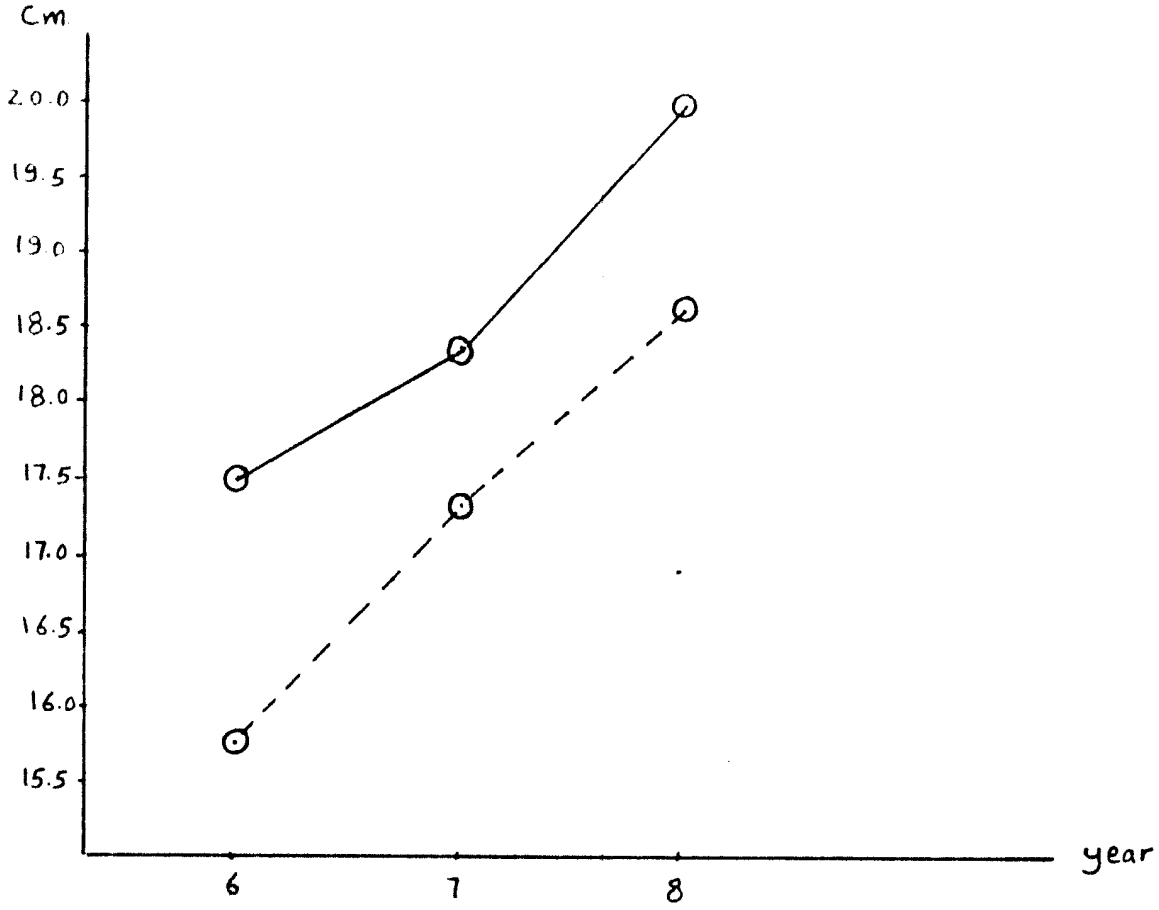

Fig. 6: *Means of the girls' arm circumference by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 6 gives the number of girls of the two classes at different ages and their mean arm-circumferences with the corresponding standard deviations. It also shows the values of t. test.

According to this table, we find that:

- The mean arm-circumference of 50 girls of the upper class is 17.48 cm at 6 years, 18.36 cm at 7 years and 19.92 cm at 8 years; while those of the lower class are having a mean arm circumference of 15.76 cm at 6 years, 17.32 cm at 7 years and 18.62 at 8 years.

- There are significant differences between means of girls' arm circumferences of the two classes at the age of 6 and 8 years only, but there is no significant differences between the two groups at the age of 7 years old.

Figure 6 shows the mean arm-circumferences of girls of the two classes in relation with their ages.

Table 7.

Means and standard deviations of the boys' chest circumference according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	54.68	3.4	50	52.64	3.62	2.88**
7	50	55.24	3.82	50	53.34	4.47	2.26*
8	50	56.62	1.73	50	55.22	2.54	3.19**

** Significant at level of 0.01

* Significant at level of 0.05

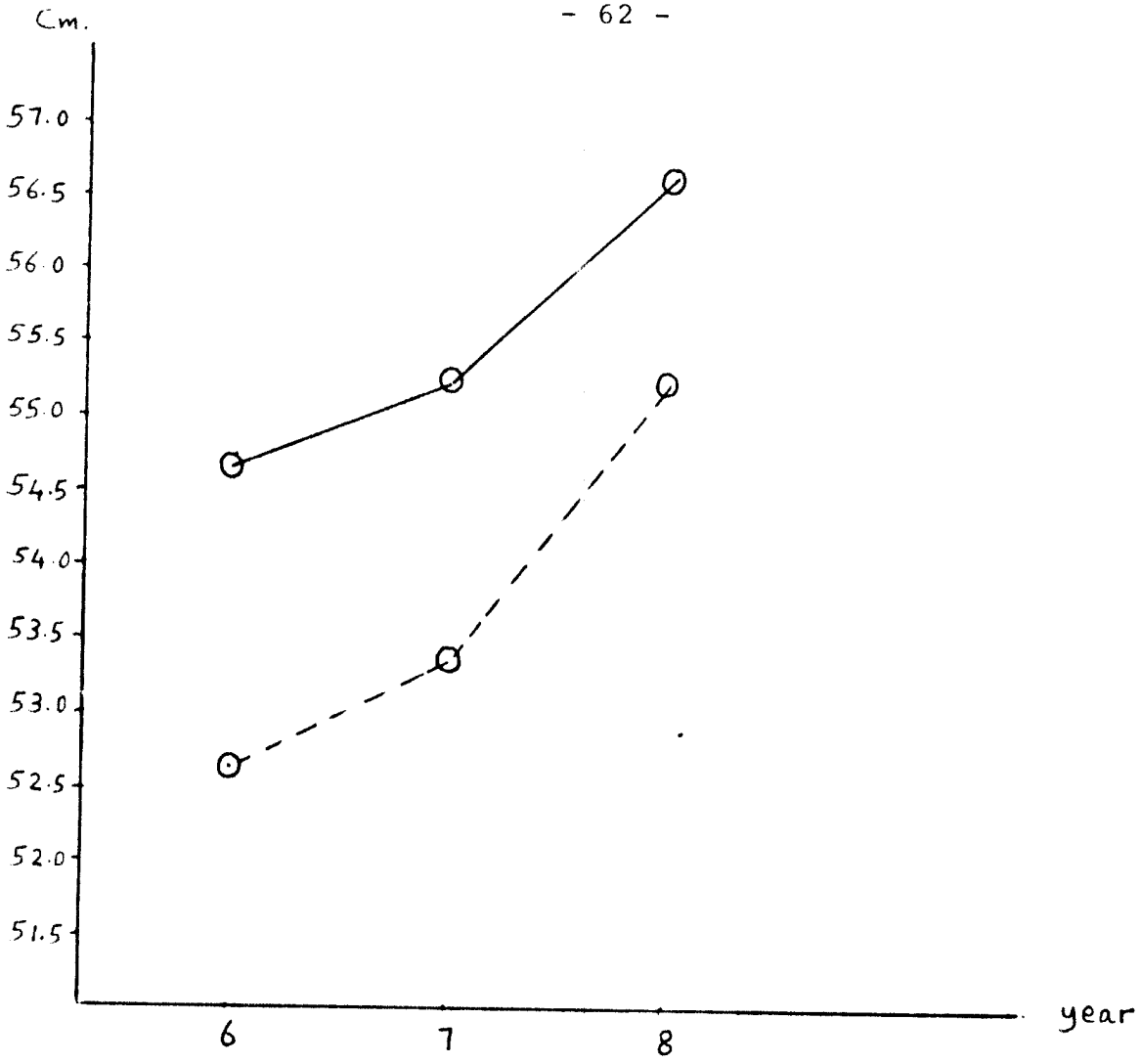

Fig. 7: *Means of the boys' chest circumference by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 7 gives the number of boys of the two classes at different ages and their mean chest-circumferences with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean chest circumference of 50 boys of the upper class is 54.68 cm at 6 years 55.24 cm at 7 years and 56.62 cm at 8 years; while those of the lower class are having a mean chest-circumference of 52.64 cm at 6 years, 53.34 cm at 7 years and 55.22 cm at 8 years.

- There is a significant difference between means of boys' chest circumferences of the two classes at each of the different ages.

Figure 7 Shows the mean chest-circumferences of boys of the two classes in relation with their ages.

Table 8.

Means and standard deviations of the girls' chest circumference according to their ages and socio-economic levels.

age	Upper socioeconomic			Lower socioeconomic			t. value
	No	Mean (cm)	S.D.	No	Mean (cm)	S.D.	
6	50	53.88	4.87	50	51.96	3.551	2.23*
7	50	54.06	3.55	50	52.66	3.16	2.1*
8	50	55.32	2.6	50	54.22	2.55	2.12*

* Significant at level of 0.05

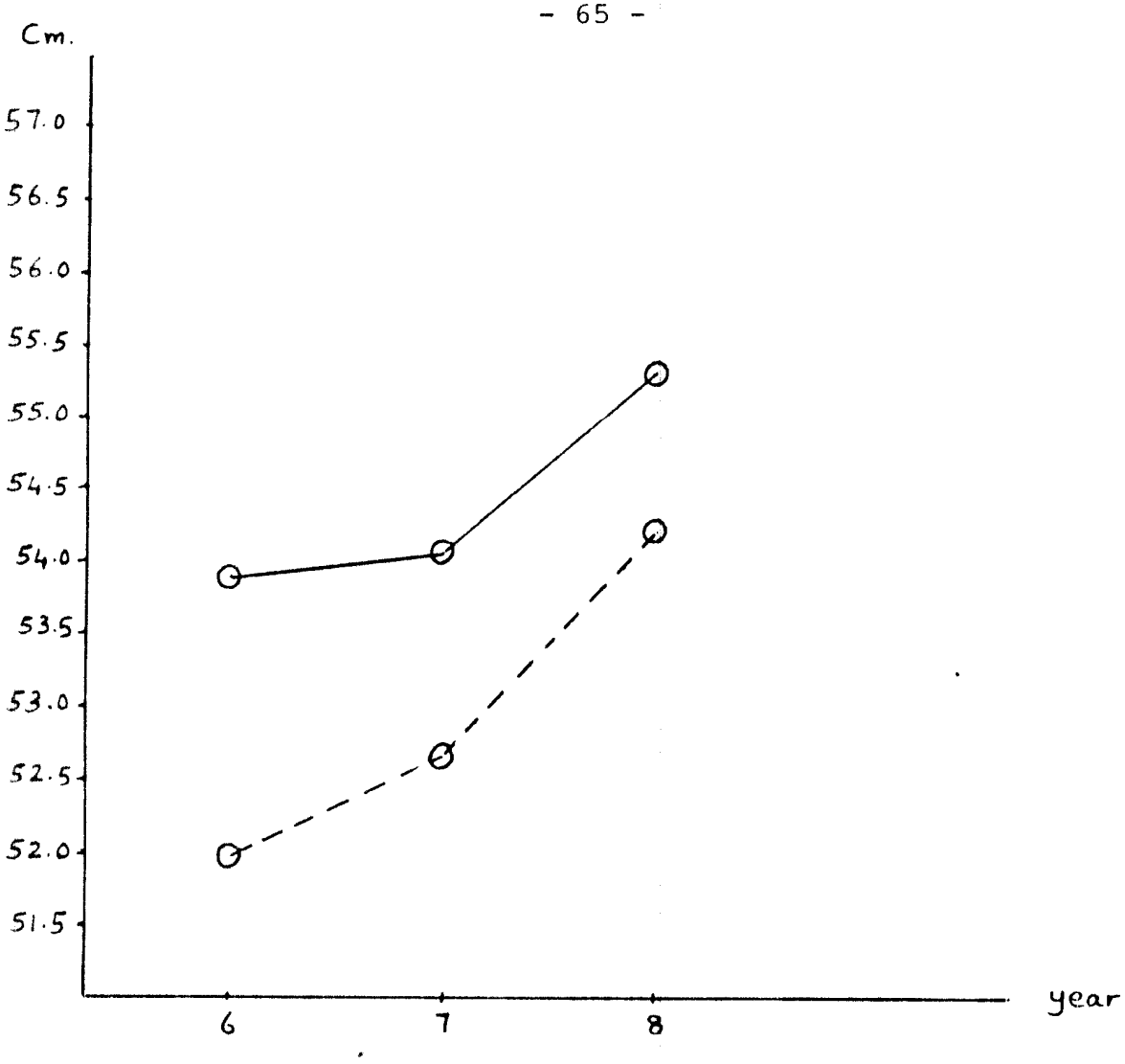

Fig. 8: *Means of the girls' chest circumference by age for the two socio-economic classes.*

———— *Upper socio-economic class.*

- - - - - *Lower socio-economic class.*

Table 8 gives the number of girls of the two classes at different ages and their mean chest-circumferences with the corresponding standard deviations. It also shows the values of t. tests.

According to this table, we find that:

- The mean chest-circumference of 50 girls of the upper class is 53.88 cm at 6 years, 54.06 cm at 7 years and 55.32 cm at 8 years; while those of the lower class are having a mean chest-circumference of 51.96 cm at 6 years, 52.66 cm at 7 years and 54.22 cm at 8 years.

- There is a significant difference between means of girls' chest-circumferences of the two classes at each of the different ages.

Figure 8: Shows the mean chest-circumferences of girls of the two classes in relation with their ages.

CHAPTER : V

DISCUSSION

This study aims at finding out if there are differences in growth pattern of children of different socio-economic levels in our society. Socio-economic levels may affect many aspects of life such as the cultural concepts, dietary habits, food consumption, ability to purchase quantity and quality of the diet. The behaviour of the family towards the child in view of nutrition, medical care and infection will be the result of the interaction between these.

The socio-economic level has proved to be an extremely useful epidemiologic variable because it reflects education, income, values, health, behaviour and life style. All these variables influence the health status (Cross and Harkawy, 1980).

In our present work the results show that:

1. Height:

By careful study of tables 1,2 and figures 1,2 we can say that:

First - For both sexes of the two classes, there are gradual steady increases in the mean values of height by the increase of the age. This pattern was also found by Sinclair (1975) and Tanner (1978).

Second - For each of the two classes, the mean height of boys exceeds that of girls of the same age. (Table 9). Also Lowrey (1978) and Tanner (1978) gave the same difference between boys and girls of the same age.

Age	Upper socio-economic class		Lower socio-economic class	
	Boys	Girls	Boys	Girls
6	117.9 cm	116.5 cm	110.54 cm	109.3 cm
7	123.52 cm	119.54 cm	116.74 cm	115.72 cm
8	126.44 cm	124.86 cm	121.28 cm	120.22 cm

Table 9: Comparison of mean height between boys and girls of the same class.

Third - Figure 1,2 show that there is a lack of straightness of the results. This can be best explained by the relative insufficiency of the number of measured boys and girls and also by the wide interval between the age-groups.

Fourth - Both boys and girls of the upper socio-economic class are taller than those of the lower one at all age-groups (6,7 and 8 years). Regarding the t-tests, all the six tests are highly significant (at the level of 0.001) indicating that there are marked differences in mean heights between the two classes.

Sinclair (1975) and Tanner (1978) also found that children of high standard of living were taller than those of low standard.

Kaul et al. (1982) also found that the mean heights were significantly higher in upper socio-economic class than in lower one. Fox et al. (1981) reported that the difference in height between social classes becomes established by the age of two years. Rona (1981) stated that the gap between the social

classes increases with the child's age.

Also the local primary Egyptian works in this field gave the same difference between the two classes. Hafez et al. (1981) found that height of children was related to social class, higher social status was associated with better height and vice-versa. Zaky (1985) said that "Both boys and girls of upper socio-economic class are taller than those of the lower group". Basiouni (1986) who made the work among Egyptian children aged 1 to 5 years, gave the same difference in height between the two socio-economic classes.

Fifth - The difference between mean heights of boys according to the socio-economic class is more marked than that of girls (Table 10). This is also reported by Ekisawa as he stated that females are considered to be more buffered against adverse social condition due to the presence of two big "x" chromosomes while males have only one "x" and a small "y" chromosome (Ekisawa et al., 1982).

Age	The difference in boys	The difference in girls
6	7.36 cm	7.2 cm
7	6.78 cm	3.82 cm
8	5.16 cm	4.64 cm

Table 10: Difference between mean heights according to the socio-economic class for both boys and girls.

2. Weight

By careful study of tables 3,4 and figures 3,4 we can say that:

First - For both sexes of the two classes, there are gradual steady increases in the mean values of weight by the increase of the age. This pattern was also found by Sinclair (1975) and Tanner (1978).

Second - For each of the two classes, the mean weight of boys exceeds that of girls of the same age. (Table 11). Also Lowrey (1978) and Tanner (1978) gave the same difference between boys and girls.

Age	Upper socio-economic class.		Lower socio-economic class.	
	Boys	Girls	Boys	Girls
6	20.27 kg	19.44 kg	17.76 kg	17.4 kg
7	21.68 kg	21.08 kg	20.48 kg	20.28 kg
8	24.46 kg	23.95 kg	23.14 kg	22.82 kg

Table 11: Comparison of mean weight between boys and girls of the same class.

Third - Both boys and girls of the upper socio-economic class are heavier than those of the lower class at all age-groups (6,7 and 8 years). Regarding the t-tests, only two tests of the whole six tests are significant, while the other four tests are not significant.

This indicates that the socio-economic class affects height more than weight. This may be due to the availability of low-priced starchy food that may counterbalance the adverse effects of socio-economic factors on weight. Tanner (1978) gave an interesting result as he found that children of low standard of

living were heavier than those of high standard and he explained this because of their diet which depended mainly on carbo-hydrates. On the other hand, Sinclair (1975) found that high standard-children were heavier than their peers of low standard. Kaul et al. (1982) gave also the same difference in weight among Indian boys.

The local primary Egyptian works in this field gave a difference in weight in favor of the high socio-economic children (Hafez et al., 1981 and Bassiouni, 1986). El Hadidy (1985) found that there was no marked significant difference between the mean weights of the two classes.

Fourth - The difference between mean weights of boys according to the socio-economic class is more marked than that of girls (Table 12). This is also suggested by Ekisawa et al. (1982) as it is mentioned before.

Age	Thd difference in boys	The difference in girls
6	2.51 kg.	2.04 kg.
7	1.2 kg.	0.8 kg.
8	1.32 kg.	1.13 kg.

Table 12; Difference between mean weights according to the socio-economic class for both boys and girls.

3. Arm Circumference:

By careful study of tables 5,6 and figures 5,6 we can say that:

First - For both sexes of the two classes, there are gradual steady increases in the mean values of arm-circumference by the increase of the age. This pattern was also found by Frisancho (1974).

Second - For each of the two classes, the mean arm - circumference of boys tends to be slightly less than that of girls of the same age. (Table 13). Frisancho (1974) gave the same results and he explained that partially because of the development of abundant subcutaneous fat which is continuous throughout childhood, adolescence and adulthood; while in males it is characterized by slow opposition. Sinclair (1975) attributed this difference to the "Y" chromosome which exerts a retarding action on the skeletal maturation in boys.

Age	Upper socio-economic class.		Lower socio-economic class	
	boys	girls	boys	girls
6	17.12 cm	17.48 cm	15.68 cm	15.76 cm
7	18.14 cm	18.36 cm	17.26 cm	17.32 cm
8	19.1 cm	19.92 cm	17.8 cm	18.62 cm

Table 13: Comparison of mean arm-circumference between boys and girls of the same class.

Third - Both boys and girls of the upper socio-economic class are having greater mean arm-circumference than those of the lower one at all age-groups (6,7 and 8 years).

Regarding the t-tests, five tests of the whole six tests are significant and only one t-test is not significant (in girls aged 7 years). This indicates that the socio-economic class affects the arm circumference more than its effect on the weight but not like that on the height. Spurr et al. (1983) stated that "Not only weight and height are influenced by socio-economic classes, but also other anthropometric measurements, for example skin-fold thickness,

mid arm-circumference, head-circumference and sexual maturation". Rezkallah (1980) found that children from larger families had a lower mean value of arm-circumference than that of children from smaller families, at the same age.

4. Chest-circumference

Lastly by careful study of tables 7,8 and figures 7,8 we can say that:

First - For both sexes of the two classes, there are gradual steady increases in the mean values of chest - circumference by the increase of the age. This pattern was also found by Tanner, 1978.

Second - For each of the two classes, the mean chest - circumference of boys exceeds that of girls of the same age. (Table 14). Also Barnett and Einhorn (1968) gave a similar difference between boys and girls.

Age	Upper soico-economic class.		Lower socio-economic class	
	Boys	Girls	Boys	Girls
6	54.68 cm	53.88 cm	52.64 cm	51.96 cm
7	55.24 cm	54.06 cm	53.34 cm	52.66 cm
8	56.62 cm	55.32 cm	55.22 cm	54.22 cm

Table 14: Comparison of mean chest-circumference between boys and girls of the same class.

Third - Both boys and girls of the upper socio-economic class are having greater mean chest-circumference than those of the lower one at all age groups (6,7 and 8 years).

Regarding the t-tests, all the six tests are significant indicating that the socio-economic class affects the chest-circumference more than its effect on weight, arm circumference. Also Zaky (1985) gave a similar difference in favor of the upper class.

Fourth - The difference between the means of boys' chest circumference according to the socio-economic class is more marked than that of girls (Table 15). This is also reported by Ekisawa et al. (1982), as he attributed this to the difference in sex chromosomes between boys and girls.

Age	The difference in boys	The difference in girls
6	2.04 cm	1.92 cm
7	1.9 cm	1.4 cm
8	1.4 cm	1.1 cm

Table 15: Difference between mean chest-circumference according to the socio-economic class for both boys and girls.

The socio-economic condition affects growth mainly through its effect on both qualitative and quantitative aspects of nutrition. Growth retardation of lower socio-economic class children from all regions of the world begins at 6 month of age (Eveleth and Tanner, 1976).

Health and disease are another important factors, they are distributed unequally among populations. These inequalities are often related to social classes and cultural concepts that describe diverse characteristics of the person and his environment.

Klein (1980), stated that various dimensions as the income, education, occupation, nutrition and housing conditions may correlate differently with the incidence of specific diseases. In other words, dimensions that probably designate the social class of individuals correlate to different health problems in different communities. The social class had proved to be an extremely useful epidemiologic variable because it reflects education, income, values, health behaviour and life style. All these variables influence the health status (Cross and Harkway, 1980).

Two factors play a role in each socio-economic level which are the economic factor and the behaviour.

The behaviour is a dominant factor more than the economy in low socio-economic class and this leads to high child mortality rate and low growth curves. For example of their believes: in cases of diarrhea mothers stop milk feeding and instead give decoctions like karawia which aggrevate the diarrheal disease and pave the way for malnutrition. In addition they don't ask the medical advise except in late stages. Due to ignorance, mothers don't appreciate the nutritional value of different food stuffs and their effect on the growing child. Even sometimes diet of the young children is sacrified for working adults in the family.

In cases of the upper socio-economic class, we find that they volunteer to go to the doctor and prefer to pay for his service than to go to free offices. Most of them are educated, or enlighted and not necessarly rich. Also most of them have a reasonable family size. They seek medical advice early, feeding of the children makes a good part of the visit to the doctor. Also proper vaccination, follow-up and primary care is usually done at the private clinic. So we find that the behaviour is more important than the economic factor in this group of people.

CHAPTER : VI

SUMMARY AND CONCLUSION

To assess the role of the socio-economic factors on the physical growth, a comparison was held between the anthropometric measurements of two groups of children taken from two different socio-economic classes. The first group included 300 Egyptian children taken from private primary schools at Zamalek district; while the second group included another 300 Egyptian children taken from primary government-run schools at Ramelet - Boulak district. Each group was selected equally from each sex and also equally from each year. (6,7 and 8 years). Socio-economic formats were filled in to confirm the selection of the sample, then measurements were recorded for height, weight, arm and chest circumferences. Data were collected and statistically treated.

The results show that:

1. *There are significant differences between the various physical measurements of the two groups in favor of the upper socio-economic class. This can be attributed to style of living, cultural believes, dietary habits, prevalence of infection, medical care and attitudes of family towards the children.*

2. *The effect of socio-economic condition is clear and more obvious on height and chest-circumference than on weight*

and arm-circumference. This may be due to the availability of low-priced starchy food which affects weight and arm-circumference more than height and chest-circumference.

3. *Boys' arm circumferences tend to be slightly less than girls'. This is probably due to the continuous growth of abundant subcutaneous fat in females throughout childhood, adolescence and adulthood; while in males it is characterized by slow opposition.*

4. *In all anthropometric measurements, except for the arm-circumference, boys are more affected by socio-economic conditions than girls. This may be due to that: females who have two big 'X' chromosomes are more buffered against adverse social conditions than males who have only one 'X' chromosome and small 'Y' one.*

At the end of this work, the findings indicate that there are significant differences between physical growth measurements of children taken from two different socio-economic classes in favor of those of the upper one.

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Appendix

Ain Shams University
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Questionnaire

First - Personal data:

- serial number
- name
- school name
- school form
- age
- sex
- Adress, District of living.

Second-Socio-Economic format:

1. Education of mother:

	Score
- University graduate or more	3
- Secondary school graduate (general or technical).	2
- Did not complete primary school	1

2. Occupation and education of father

- Government employee and or university graduate.	3
- Skilled labour and or secondary school graduate.	2
- Manual worker and or did not complete primary school.	1

3. Family size:

- One or two children	3
- Three of four children	2
- More than four children	1

Score

4. Family Income:
   - More than 200 Egyptian pounds/month 3
   - More than 100 and less than 200 Egyptian Pounds/month. 2
   - Less than 100 Egyptian pounds/month 1

5. Crowding of dwelling and sleeping conditions:
   - One or two persons/bed room 3
   - Three or four persons/bed room 2
   - More than four persons/bed room 1

Those children who take more than 10 marks are considered as higher socio-economic class; while those who take 10 marks or less are considered as lower socio-economic class.

Third - Clinical Examination:

- General examination
- heart
- chest
- abdomen

Fourth - Anthropometric measurements:

- Height : cm.
- Weight : kg.
- Arm-circumference : cm.
- Chest-circumference : cm.

ملخص باللغة العربية

تم عقد مقارنة بين القياسات الجسمية لمجموعتين من الاطفال الماخوذين من طبقتين مختلفتين اجتماعيا واقتصاديا ، وذلك لكيما يتم تقييم دور العوامل الاجتماعية الاقتصادية على النمو الجسمى .

هذا وقد اشتملت المجموعة الاولى على ثلثمائة طفل مصرى ماخوذين من المدارس الابتدائية الخاصة بحى الزمالك ، بينما اشتملت المجموعة الثانية على ثلثمائة طفل مصرى اخرين ماخوذين من المدارس الابتدائية الحكومية بحى رملة بولاق ، وقد روعى ان تكون كل مجموعة مكافئة لنظيرتها فى الجنس والعمر .

وقد تم استيفاء الاستمارات الاجتماعية الاقتصادية للتثبت من اختيار العينة ، ثم سجلت قياسات الاطوال والاوزان ومحيطات الذراع والصدر لكل طفل ، وجمعت البيانات وتمت معالجتها احصائيا .

<u>وتوضح النتائج ما يلى</u> :

١ــ توجد اختلافات دلالية واضحة بين القياسات الجسمية المختلفة لاطفال المجموعتين وذلك لصالح اطفال الطبقة الاعلى .
ويمكن ان يعزى هذا الى اسلوب معيشة الاسرة ومعتقداتها الثقافية وعاداتها الغذائية ، كما يمكن ان يعزى الى نسبة انتشار المرض والعناية الطبية التى يلقاها الطفل ثم الى اتجاهات الاسرة نحو الطفل فى كل من الطبقتين المختلفتين .

٢ــ يظهر اثر العوامل الاجتماعية الاقتصادية بصورة اكثر وضوحا على قياسات الاطوال ومحيطات الصدر عنها على الاوزان ومحيطات الذراع وقد يكون هذا راجعا الى وفرة النشويات رخيصة الثمن والتى تؤثر على قياسات الاوزان ومحيطات الذراع اكثر من تاثيرها على قياسات الاطوال ومحيطات الصدر .

٣ــ تميل محيطات اذرع الاولاد الى ان تكون اصغر قليلا منها عند البنـــات وربما يرجع ذلك الى النمو المطرد للطبقة الدهنية تحت الجلدية عنـــد البنات خلال مراحل الطفولة والمراهقة والبلوغ بينما تتميز هذه الطبقـــة بالترسيب البطيء عند الاولاد •

٤ــ يتاثر الاولاد بالظروف الاجتماعية الاقتصاديـة فى كل القياسات الجسميـة ــ عدا محيط الذراع ــ اكثر من تاثر البنات بتلك الظروف وقد يعـــزى هذا الى ان البنات اللاتى يحملن زوجا من الكروموسومات الكبيرة (xx) يكن اكثر تحملا لظروف البيئة السيئة من الاولاد الذين يحملون كروموسومـا كبيرا واحد 'x' واخرا صغـيرا 'y' •

وفى خاتمة هذا البحث فان النتائج تشير بوضوح الى ان هناك اختلافـات ظاهـرة بين قياسات النمو الجسمى لمجموعتى الاطفال المستارين من طبقتـــين مختلفتين وذلك لصالح الطبقة الاعلى اجتماعيـا واقتصاديـا •

دراسة مقارنة للنمو الجسمى بين الاطفال المصريين ٦-٧ سنوات فى مستويين اجتماعيين اقتصاديين مختلفين

بحث

مقدم من / سامح حلمى ابراهيم
بكالوريوس الطب والجراحة

توطئة للحصول على درجة الماجستير
فى دراسات الطفولة

تحت اشراف

الاستاذ الدكتور
ضيائى محمد حسين
استاذ طب الاطفال
بالاكاديمية الطبية العسكرية

الاستاذ الدكتور
سعدية محمد بهادر
الاستاذ المساعد لعلم نفس النمو
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معهد الدراسات العليا للطفولة
القسم الطبى

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