Growth And Development In Juvenile Diabetes Mellitus In Children From Age 5-14 Year.

THESIS

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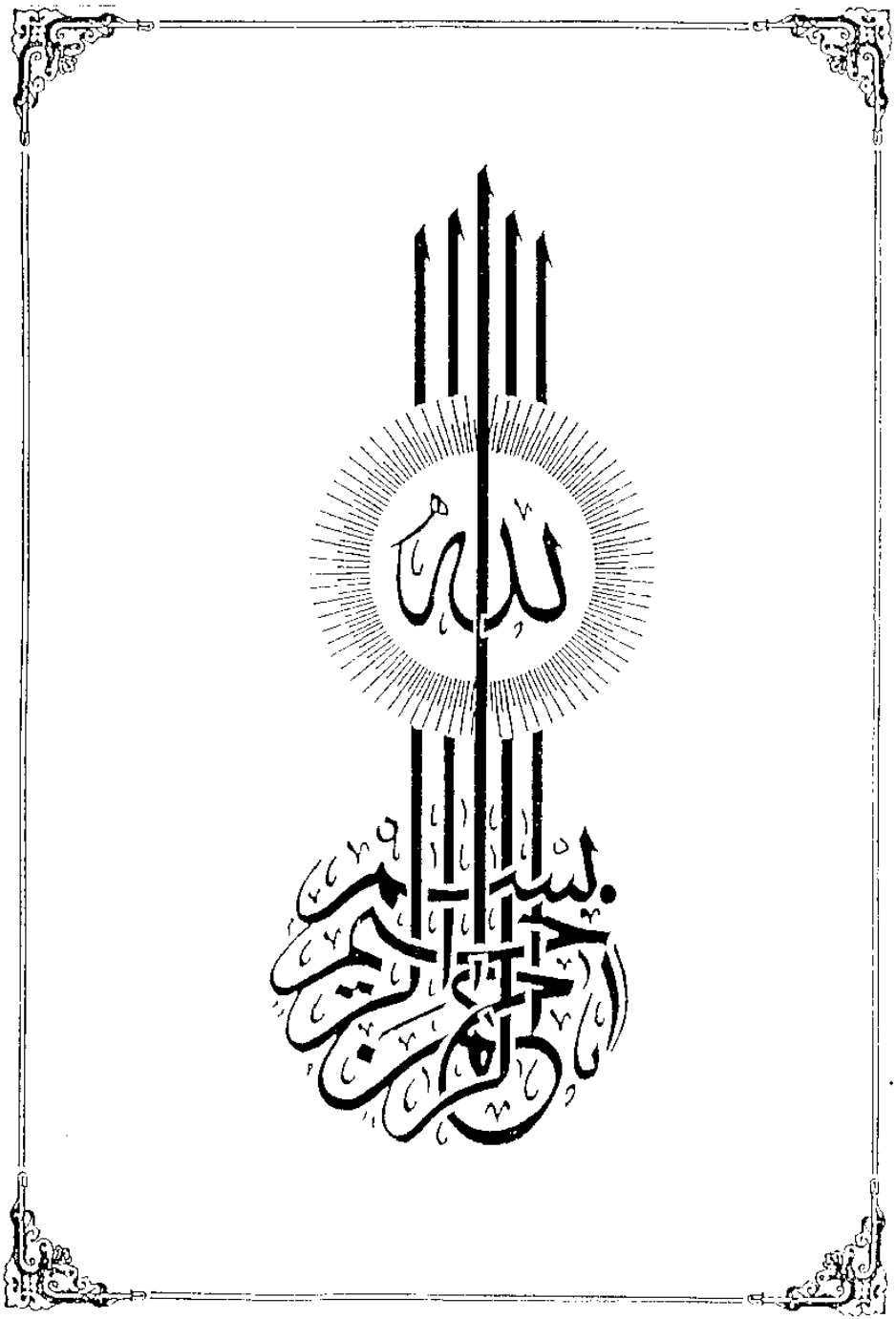

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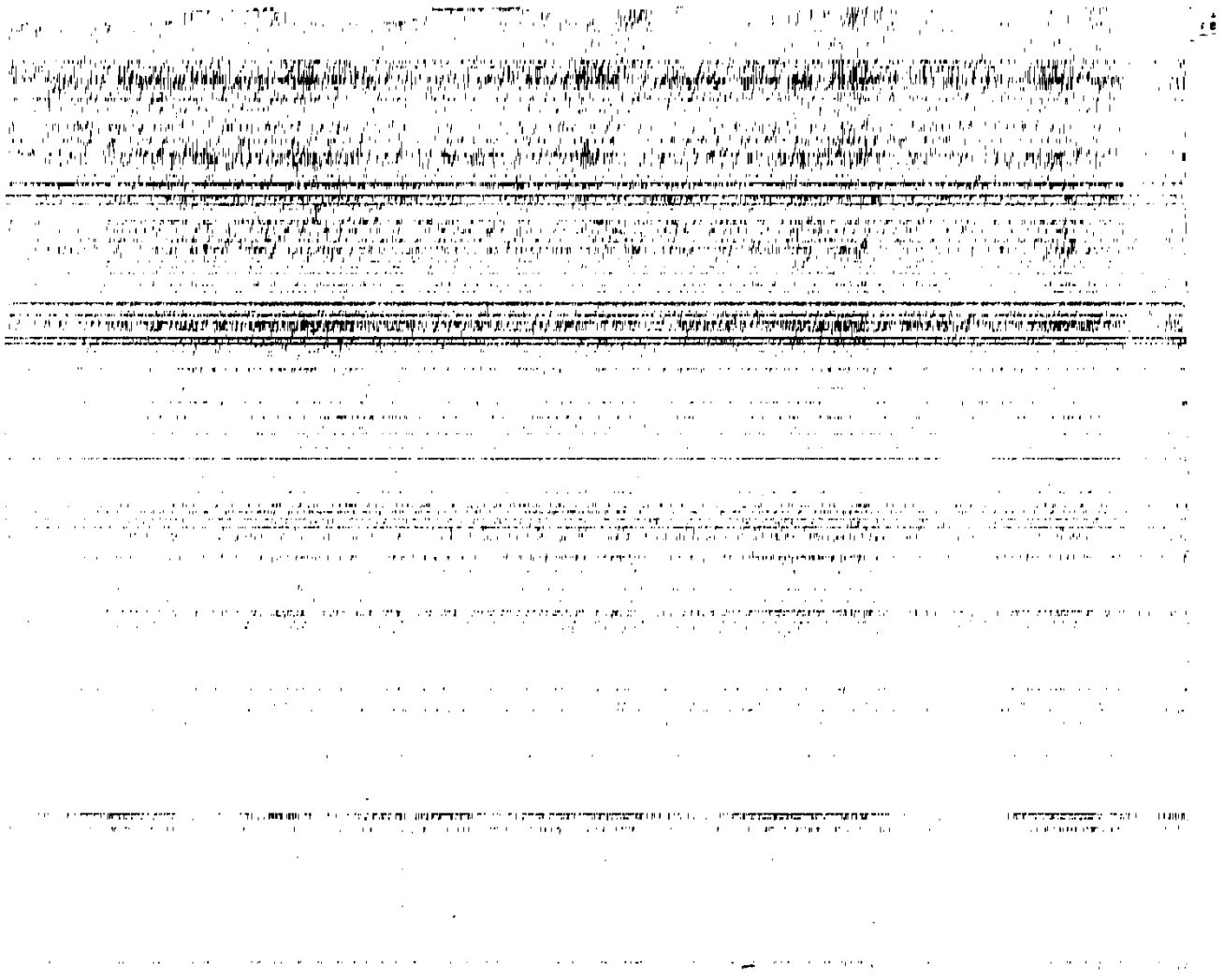

INTRODUCTION

Diabetes mellitus of the juvenile-onset variety is usually characterized by astormy onset and intense breakdown of body Fat and protein and without insulin therapy it is expected that suffers do develop keto acidosis, hyperosomlarity, dehydration and certainly will soon succumb. Again with improper insulin treatment, which is not of uncommon occurrance in juvenile diabetes, remote sequalue of the disease are sure to develop, and eventually the growth pattern of patients as well as other indices will deviate from normal standards. Growth retardation is a common disorder in uncontrolled juvenile diabetes. The first consideration in the definition of short stature for which this discussion is taken to be, height below the third centile which corresponds to three or more standard deviations below the mean, or growth velocity constantly below that to be expected at the child's age.

The present work is a trial to study and compare the growth patterns in the so called juvenile diabetics and their healthy playmates from age 5-14 years. The aim is to stress the value of early, adequate and regular specific therapy to control the disease and to prevent complications.

The commonest disorder of growth is shortness of stature and rapid growth is rarely the result of disease.

The major causes of short stature irrespective of their importance are:

I- Familial short stature.

II- Constitutional growth retardation.

III- Psychosocial dwarfism.

IV- Malnutrition.

V- Chronic disease.

VI- Intrauterine growth retardation.

VII- Chromosomal anomalies.

VIII- Endocrine glands:

1) Insuline deficiency (diabetes mellitus).

2) Growth hormone deficiency.

3) Corticosteriod excess.

4) Thyroid deficiency.

5) Precocious puberty.

IX- The skeletal dysplasias.

(Rimoin and Harton, 1978).

Malnutrition comes first in Egypt as a cause of short statuse.

FACTORS AFFECTING GROWTH AND DEVELOPMENT

In general, the outcome of statural growth is the outcome of interaction of genetic and environmental factors.

1) Genetic Factors:

Hereditary characteristics are dependent on the action of genes or the combined actions of several genes. The development potentials of an individual are couched in the gene complement, established at fertilization. Each of these genes exerts an influence on the developing embryo and fetus , as well as setting atemplate for future growth of the child. Potentials for growth and development are determined by the interplay of inherited genes (Faulkner, 1966). Genetic expression can be modified by a variety of environmental factors, In essense, genetic constitution may prognosticate the potentials and formal of growth and development, but these patterns can be modified by a various exogenous influences (Hughes, 1980). Two groups of genes are responsible for growth. The first group is concerned with the determination of adult stature. These genes have little effect on intrauterine growth but after birth they increasingly influence the growth of healthy children. The correlation between a child's height and the mean height of both parents increases from 0.2 at birth to 0.5 at two years

of life. The second and different group of genes determines growth rate and bone development. There fore there is a group of children who grow slowly and appear short throughout childhood, but as they have a late puberty they grow for more years than usual and eventually their adult height may be normal (Parken, 1978).

At birth, males have been found to be slightly bigger than females (Abbassy, et al., 1973).

The typical girl height is slightly shorter than that of the boy at all ages till adolescence. Then she becomes taller shortly at the age of 11 years (Silver, 1976; Tanner; 1973) Growth is in general a very regular process. From 13 to 15 years of ages, these is a marked acceleration of growth in males called the adolescent growth spurt. In female, spurt takes place 2 years earlies than males.

A slight increase in velocity is sometimes said to occur between about 6 and 8 years (Tanner, 1973).

2) Endocrine glands:

Endocrine 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 regulatory agents for various body functions (Abbassy, et al., 1923).

The most important hormones that influence growth and development are: growth hormone (GH); thyroid hormone (T_4,T_3), insulin, cortisol and gonadol hormones (estrogens and endrogens).

i) Growth Hormone:

The pituitary gland is probably one of the most important of the endocrine organs that regulate growth and development. Growth hormone apparently functions by stimulating DNA synthesis and cell multiplication. This hormone has a major influence on increasing cell numbers during the period from late infancy to adulthood. The main functions of growth hormone are:

a) Stimulates the transport of aminoacids across cell membranes and promotes the synthesis of protein.
b) Promotes cartilage growth.
c) Increases total fattly acid catabolism and mobilizes free fatty acids, and increases the metabolism of carbohydrates (Wall et al., 1980).

Growth hormone (GH) is by far the most abundant hormone n the human pitutitary gland, and the primacy of this hormone n controlling postnatal somatic growth is unquestioned. Nevetheless, perhaps more unresolved questions surround the chemstry and physiology of GH than is the case with any of the ther major hormones. Critical questions remain concerning he factors controlling GH secretion , the chemical ature of the active growth principle ,

and the mechanisms by which GH produces its multiple effects (Kostyo et al., 1977).

It appears that growth hormone stimulates skeletal growth through production of intermediary hormones named somatomedins (Formerly known as sulfation Factors).

Several somatomedins have been purified, including somatomedin-A, somatomedin-C, insulin-like growth factors (IGF) I and II, and others.

Somatomedins are peptides with molecular weights about one third that of growth hormone and appear to be synthesized in liver and kidney. They circulate in plasma bound to carrier proteins and are believed to mediate the effects of growth hormone on cartilage and other skeletal tissues, their effects on other tissues remain undefined. Growth hormone-deficient children have low levels of somatomedins, which return to normal during treatment with human growth hormone (Digeorge, 1983) pituitary growth hormone is the single most important hormone stimulating growth after the second year, but it does not appear to influence maturation (Kaplan, 1969).

Thyroid hormones:

Thyroxine, a small molecule available synthetically is necessary for normal growth from early foetal life on wards, and for normal physiological function in children and adults. It begins to be secreted at about the 15th to 20 th post menstrual week and is essential in the foetus

and very young child for protein synthesis in the brain and for the proper development of nerve cells (Tanner, 1978).

The importance of thyroid hormone for normal post-natal somatic growth is exemplified by the severe growth failure that regularly accompanies thyroid hormone deficiency. Unlike most other disorders that slow linear growth, severe hypothyroidism causes nearly absolute growth arrest. Following correction of the thyroid hormone deficiency, growth is usually resumed at extra ordinarily rapid rates, a period of so-called catch-up growth (Cender wood et al., 1981).

In hypopituitary dwarfism, the thyroid hormone and growth hormone seem to be mutually permissive for maximal growth promotion. Not only is the longitudinal growth retarded, but also the ossification centers appear late and the moddling of bone shape is immature (Anderson, 1975).

Insulin:

Insulin is produced by the is lets of langerhans (collection of cells in the pancrease) it causes glucose to be absorbed into cells, and stored as glycogen in the liver and muscler. It is present in children just as in adults and has no particular action as for as growth is

concerned except that it must be present in normal amounts for normal growth to occur. Diabetic children whose diabetes is well controlled by injected insulin and a suitable diet grow quite normally, but even a small degree of laxity in the control produces stunting and retardation of growth (Tanner, 1978).

There are a variety of observations which raise the possibility that insulin, in addition to its primary role as the regulator of carbohydrate homostasis, may function as a stimulator of growth.

The contrast between over sized, hyper insulinemic infants born to diabetic mothers and the poor growth of diabetic newborns with insulin deficiency has given rise to the suggestion that insulin is a primary stimulator of somatic growth in the fetus, hyperinsulinism is also a constant feature in over grown infants with beckwith-Wiedemann syndrome, and insulinopenia prevails in small newborns with pancreatic agenesis (Hill, 1978).

In postnatal life, there are a number of clinical conditions in which insulin deficiency is associated with growth failure and hyperinsulinism is accompanied by a - vergrowth. Examples of the former include malnutrition, inadequately treated diabetes mallitus, and untreated hypopituitarism. While insulinopenia may be only a compensatory mechanism, the diversity of these conditions raises the question whether, in one or more of them,