COMPARATIVE STUDY OF THE THYROID GLAND STATUS IN OVER AND UNDER WEIGHT CHILDREN

Thesis

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BY

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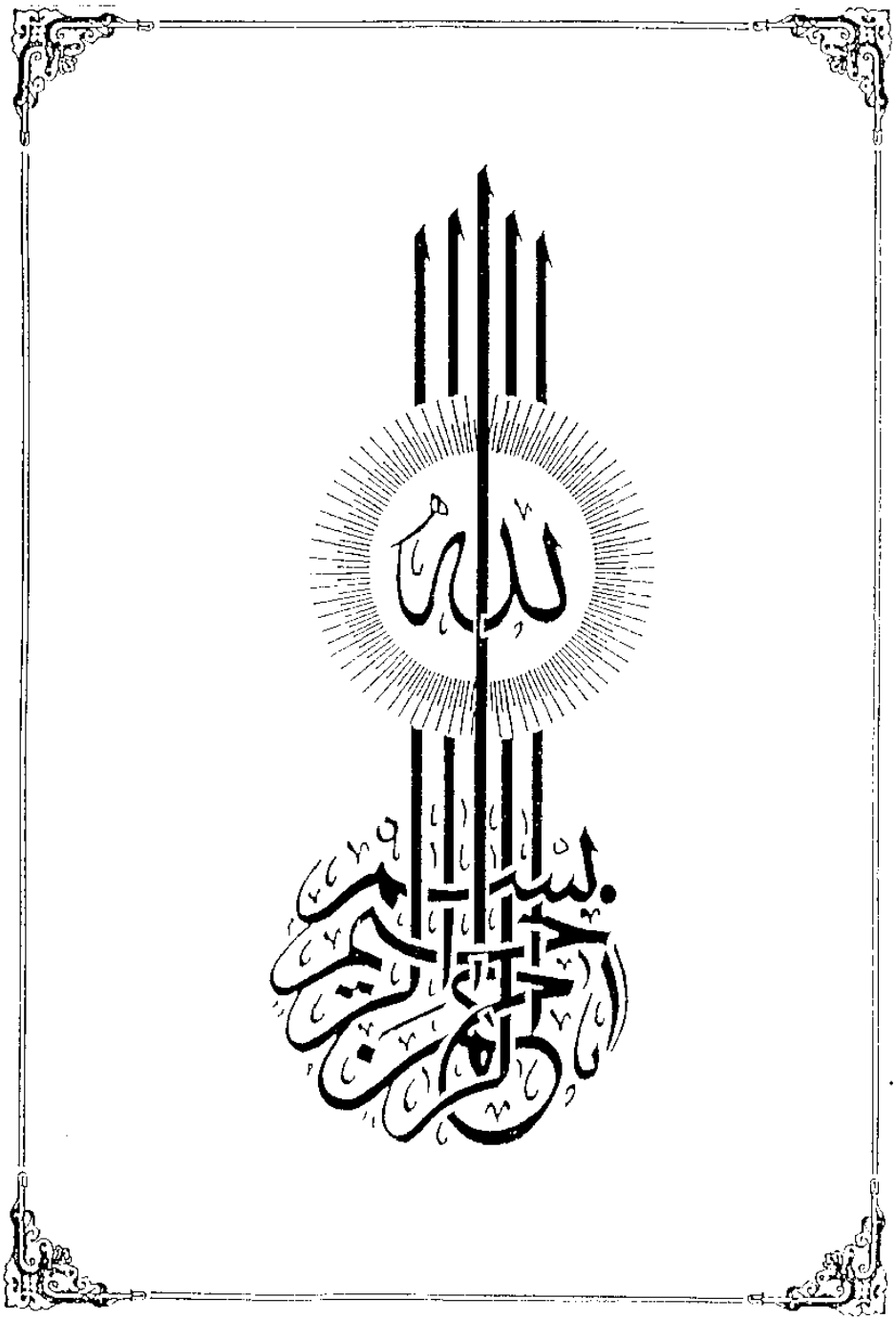

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INTRODUCTION

I N T R O D U C T I O N

The body weight is influenced by several factors that are either environmental or originating from the individual himself. Consequently, any disturbance in one of these factors may lead to changes in the body weight. Obesity may be accompanied by hormonal changes as increased insulin and corticosteroids or decreased testosterone level.

Sims et al. (1973) stated that changes in the level of thyroid hormones have a direct effect on metabolic rate which affect the body weight. They also stated that; decrease in thyroid hormones during weight loss might play a role in the decline in the caloric requirements. Similarly, increase in the thyroid hormones level during overeating

may be one mechanism for increasing the thermic effect of food and subsequently to increase in the caloric requirements.

So, changes in body weight, in many of its forms, is closely related, if not actually dependent on endocrine imbalance, and the thyroid gland is usually the endocrine factor that is most important. The aim of this work is to explore the relation between body weight and the circulating level of thyroid hormones in over and under weight children.

REVIEW OF LITERATURE

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Disorders of the thyroid gland in childhood more often lead to a state of hypothyroidism than to hyperthyroidism. Some cases of sporadic goitre and carcinoma are usually compatible with the euthyroid state. So, study of the development of the gland always helps in the diagnosis and consequently the management of different cases associated with thyroid disturbance.

EMBRYOLOGY AND ANATOMY

The main anlage (primordium) of the thyroid gland develops as a median entodermal downgrowth from the first and second pharyngeal pouches. During its migration caudally, it contacts the ultimobranchial bodies developing from the fourth pharyngeal pouches. When it reaches its position that it occupies in adult, just below the cricoid cartilage, the thyroid is divided into 2 lobes.

The site from which it originates persists as the foramen ceacum at the base of the tongue. The pathway the gland follows may result in thyroglossal remnants (cysts) or ectopic thyroid tissue (lingual thyroid). A pyramidal lobe is frequently present.

The normal thyroid weighs 15-25gm. and is situated in the neck opposite the 5th, 6th and 7th cervical vertebrae. It consists of 2 lateral lobes, isthmus and pyramidal lobe. The apex of the lobe lies on the thyroid cartilage below the oblique line while its base is at the level of the 6th tracheal ring. The isthmus lies opposite the 2nd, 3rd, and 4th tracheal rings. The pyramidal lobe springs from the isthmus and is connected to the hyoid bone by the levator glandulae thyroidae.

It has 2 capsules a true one and a false capsule or pretracheal fascia. The parathyroid glands are usually embedded in the back of the false capsule. The gland is well vascularized, and the thyroid has one of the highest rates of blood flow per gram of tissue of any organ in the body. It is supplied by 2 pairs of arteries, the superior and inferior thyroid arteries.

PHYSIOLOGY AND BIOCHEMISTRY

The thyroid gland maintains the level of metabolism in the tissues that is optimal for their normal function. Thyroid hormone stimulates the O_2 consumption of most of the cells in the body. It helps and

regulates lipid and carbohydrate metabolism, and is necessary for normal growth and maturation.

The thyroid gland is not essential for life, but in its absence there is poor resistance to cold, mental and physical slowing, and, in children, mental retardation and dwarfism will result.

Conversely, excess thyroid secretion leads to body wasting, nervousness, tachycardia, tremors, and excess heat production.

Thyroid function is controlled by the thyroid stimulating hormone (TSH) of the anterior pituitary. The secretion of this trophic hormone is in turn regulated in part by a direct inhibitory feed back of high circulating thyroid hormone levels on the pituitary and in part via neural mechanisms operating through the hypothalamus. In this way, changes in the internal and external environment bring about appropriate adjustments in the rate of thyroid secretion. The thyroid gland also secretes calcitonin, a calcium-lowering hormone (*William F. Ganong, 1977*].

IODINE METABOLISM

Iodine is essential for thyroid hormone synthesis. Iodine ingested in the diet is absorbed from the

gastro intestinal tract into the plasma where it circulates in the form of iodide. Much of this iodide is trapped and concentrated by the thyroid gland. Most of the remainder is excreted by the kidneys. The iodide trapped by the gland is at first in dialyzable form with the plasma. In the normal thyroid it is almost immediately incorporated into the thyroglobulin and is then no longer exchangeable with the plasma iodide.

The incorporation of the trapped iodide into thyroglobulin is dependent upon the oxidation of the iodide to free or elemental iodine which then combines with tyrosine in peptide linkage within the thyroglobulin.

It would appear that tri-iodothyronine (T_3) and thyroxine (T_4) are formed by the coupling of one molecule of mono-iodotyrosine and one di-iodotyrosine, or of two molecules of di-iodotyrosine respectively.

The iodothyronines (T_3 and T_4) and the iodotyrosines (MIT and DIT) are stored within the thyroglobulin until this thyroprotein is digested by thyroid proteases and peptidases.

When thyroxine (T_4) is liberated from thyroglobulin to enter the blood stream it circulates bound to a

specific thyroxine-binding globulin (TBG). Some T_4 is also bound to prealbumin (TBPA). Tri-iodothyronine (T_3) is less firmly bound to a globulin and other plasma proteins. It is not bound at all to (TBPA) and its easier release to the tissues accounts for its more rapid metabolic effects. The principal pathway for the metabolism of the thyroid hormones is de-iodination. Some portions of the thyroid hormones undergo glucuronation in the liver, other undergo de-amination and transamination.

O B E S I T Y

Obesity is defined esthetically as fatness beyond the socially acceptable forms, or medically as adipose tissue in excess of that consistent with good health of mind and body. Most cases of obesity seen in clinical practice are due to the interaction of cultural forces that encourage excess intake together with other factors that favour the synthesis of fat. While it is rare for the obese child or adolescent to have an underlying endocrine or metabolic abnormality, the possibility of endocrine disease is thought by the parents of obese patients.

In general, endocrinological diseases associated with obesity are uncommon. While hypothalamic lesions may cause obesity; they are usually associated with neurological findings, or in association with systemic diseases.

In dealing with the problem of obesity, there is a fact about regulation of food intake must be introduced. " A pound of excess adipose tissue is equivalent roughly to 3500 calories ". This is true when we gain an extra pound, but when we lose an extra pound, however, the relationship does not hold quite as strictly because when we start losing weight, we

lose weight that is more hydrated and the caloric equivalent is, therefore, slightly less than 3500 calories. As the weight reduction continues, the weight loss is more and more pure fat.

Thus more than 3500 calories may have to be lost in order to continue to lose at the same rate (*Jean Mayer 1973*).

DETERMINATION OF OBESITY

There is no absolute measure of body fat in relation to lean body mass; that could properly quantify the degree of adiposity. Lack of direct measurement of body fat, will lead to two kinds of problems. The first is to determine an indirect method that can be used to assess body fat and the other is to determine the degree of fatness.

The most widely used method of detecting obesity is by relating body weight to chronological age. About the only advantage that can be attributed to this method is that both weight and age are easily and inexpensively determined.

Another simple method is to correlate weight with length. Heavy babies, if long, may infact have large lean body masses and may not necessarily be obese.