# PHYSICAL MANAGEMENT OF OBESITY



## Thesis

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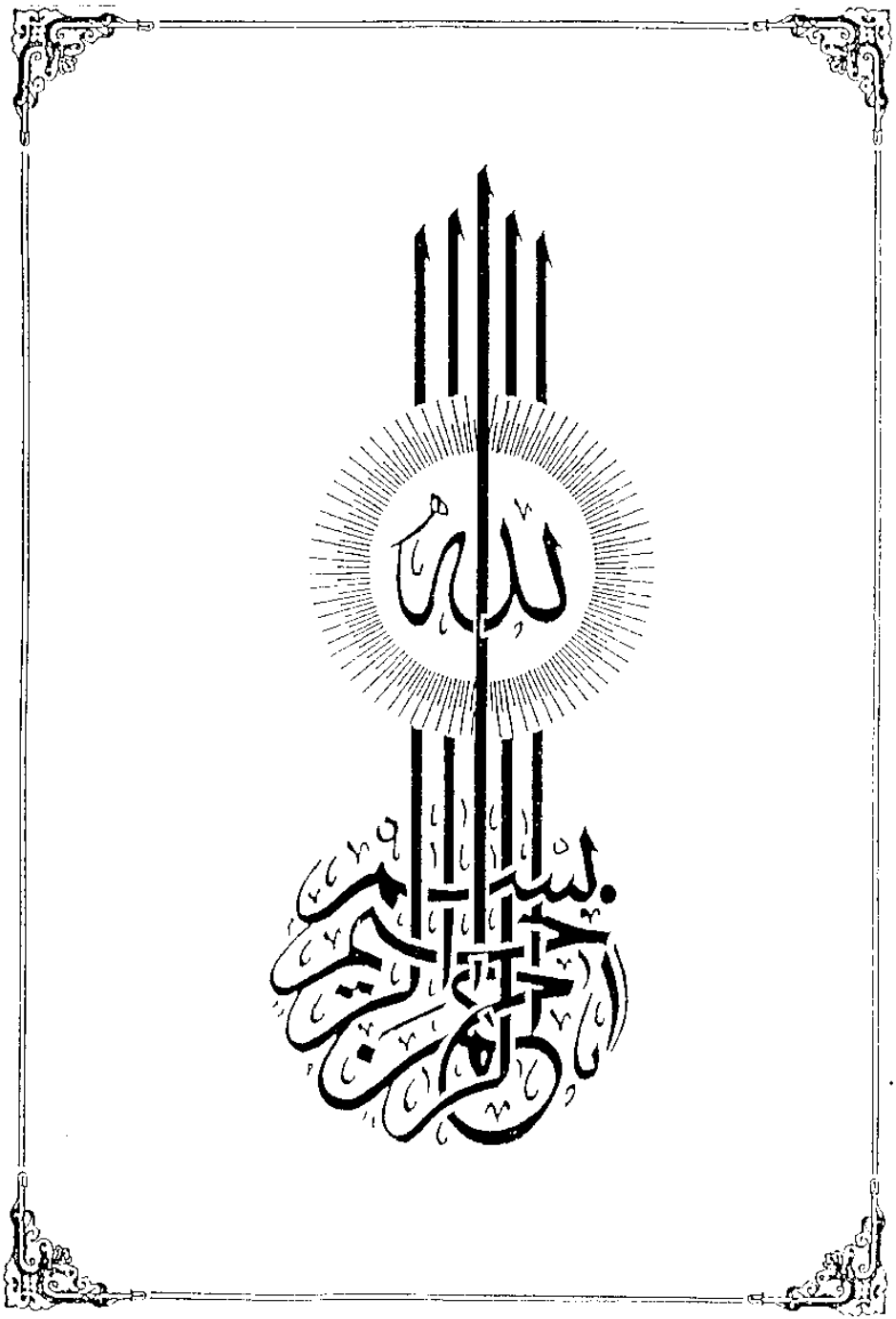

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# INTRODUCTION

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Obesity is a complex medical disorder characterized by an excess of total body fat (Salans, 1981).

The incidence of obesity rises with age reaching a peak between 40 and 60 years. It is generally higher in women than in men and tends to run in families (Silva and Tunbridge, 1980).

Rarely, can the eitiology of obesity be identified, in the overwhelming majority of patients the underlying cause of obesity cannot be determined and their condition must be classified as being of "unknown etiology".

Obesity has become one of the leading medical and public health problems whether judged by short life span, increased morbidity, or socioeconomic cost (Salans, 1981).

Obesity is associated with increased incidence of cardiovascular disease, diabetes mellitus and thromboembolism, with consequent accompaning decrease in life expectancy. Gall bladder diseases, osteoarthrosis and hiatus hernia are more common in obese patients, as well as minor complaints such as varicose veins, intertrigo and candida infection (Rossner, et al., 1984).

Documented treatment for obesity dates back at least 120 years. Many weight loss diets have been described but cure

rates have not changed substantially since early treatment attempts. One characteristic of obesity about which all physicians agree is its relative intractability, that is the tendency for obese individuals to remain obese or to regain lost weight after virtually any type of treatment program (Vassilie et al., 1983).

Exercise can produce weight loss and decrease body fat by a reduction in fat cell size. It also has a beneficial physiological and psychological effects. Unfortunately many obese patient have a sedentary life style and the decreased physical activity may contribute to the perpetuation and agravation of obesity (Bray, 1977).

Despite the multitherapeutic efforts the general population have become heavier in recent years than before and morbid obesity remains as unsolved problem (Foster, 1985).

# AIM OF THE WORK

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The aim of the work is to review the literature about diagnosis and physical management of obesity in order to choose the appropriate program of diet, exercise, and behaviour modification that help to lose excess body weight.

# REVIEW OF THE LITERATURE

## DEVELOPMENT OF BODY FAT DURING GROWTH AND AGING

Body fat (adipose tissue) consists of many cells filled to a greater or lesser degree with triglyceride fat molecules. In humans, the duration of the early adipocyte proliferative period has been estimated to last roughly from five months gestation to birth or shortly afterward(Prook, 1972).

In young persons the total mass of fat tissue can be enlarged by increasing the amount of fat stored in each cell (hypertrophy) or by increasing the number of cells in adipose tissue (Oscai, 1980).

Hypercellular obesity most often has its onset in early life, usually before the age of 20 years; obesity of later onset is usually, but not always accompanied by adipose cellular enlargement and normal cell number.
In addition to this relationship between hypercellularity and age of onset, hypercellular obesity also appears to be related to the severity of the obesity. When body weight exceeds, 170 per cent of ideal,a maximum cell size (1 to 1,2 mg lipid per cell) is apparently reached, after which cell number and obesity are highly correlated(Salans, 1971).

Weight loss and reduction in the adipose tissue mass in all adult obese patients and in most obese children regardless of age of onset or degree and duration of obesity has

so far been shown to be accompanied by a change in adipose cell size alone; cell number remains constant even in the face of massive degree of weight loss. Thus, adipose hypercellularity appears to inflict a permanent, irreversible abnormality upon the patient suffering from this type of obesity (Hirsch, and Batchelor, 1976).

Definition of obesity:-

Obesity at the simplest level, can be defined as an excess of body fat (adipose tissue) frequently resulting in a significant impairment of health. Although other bodily tissues including skeleton and muscle (lean body mass) may also, and often do, increase in the obese individual, the predominant and most characteristic anatomic changes is the excessive accumulation of adipose tissue. Thus the diagnosis of obesity depends upon the demonstration of an increased body fat content (Salans, 1981).

It was suggested that, adipose cellular enlargement (cell size) is the marker of obese state. The adipose tissue of obese individuals contains enlarged fat cell compared with those found in non-obese patients (mean cell size 0.84 vs. 0.41 ug lipid per cell)(Hirsch and Batchelor, 1976).

Sizing of adipose cells remains a research tool cannot be applied on a wide spread clinical basis or in public health studies of large populations (Salans et al., 1973).

Moron, 1980 in France has suggested that also a large number of fat cells have possible correlations to adiposity.

## MEASUREMENTS

The mean average fattness is 15 per cent for active young adult male and 25 per cent for active young female. Adult may be considered obese if he or she is 5 per cent above the mean average fattness (McArdle et al., 1981).

According to Foster (1985)the body fat can be measured by:

I Direct technique for estimating body fat:

a- Total body water.

b- Total body potassium.

c- Densitometry.

II Indirect technique for estimating body fat :

a- Skin fold measurements.

b- Weight: Height ratio.

### I Direct techniques for estimation of body fat:

#### a) Determination of body fat from total body water

Lean body mass includes body solids and intracellular and extracellular water, and excludes body fat. Strictly speaking, lean body mass is defined as that fraction of body weight that is required to contain total body water at the percentage normally found in lean tissues. Since adipose tissue is assumed to be anhydrous, fat-free body and lean body mass are usually used synonymously. Fat free tissue is approximately 72% water (Pace and Ruthun, 1945).

Based on the two assumption that adipose tissue is anhydrous and that lean body mass is 72% water, lean body mass in normal subjects can be calculated by this formula.

Lean Body mass = total body water $\div$ 0.72 Therefore a close approximation of body fat is :

Body fat = total body weight - lean body mass

Body Fat = total weight -(total body water $\div$ 0.72 )

Total body water has been calculated using tritiated water ($^3H_2O$). In this dilutional technique, a known volume of a known concentration of tritiated water is injected intravenously, and after equilibration (2-3 hours), blood samples are drawn and the concentration of tritium in the blood sample is determined. If the tritiated water equilibrates in the space termed total body water then the volume of that space can be easily calculated using this formula: (Concentration of injected $^3H_2O$)X(Volume injected)=(Total body water)X(Concentration of $^3H_2O$ in blood sample).

Total body water measurement using dilutional technique is impractical for clinical evaluation (Grande, 1975).

b) Total body potassium:

Estimates of lean body weight can also be made through measurement of total potassium in the body, assuming that potassium is essentially limited to the fat free compartment . This can be done either by isotope dilution using $^{42}K$

or by determining $^{40}K$ in a whole body counter. In most studies a constant of 68.1 mmol $K^+$/Kg lean tissue is used, although Forebes and Welle (1983) pretered 68.1 for males and 64.2 for females. Thus,

$$\text{Lean body mass} = \frac{\text{total } K^+ \text{(mmol)}}{68.1 \text{ or } 64.2}$$

Here too the assumption of a fixed constant renders absolute values suspect since the potassium content per kilogram of intracellular water in lean tissue varies from individual to individual.

c) **Densitometry:**

The measurement of density is a technique that has been used to evaluate body composition. The basic principle of this method is that an object submerged in water diplaces its own weight. If two objects of equal volume but different densities are submerged, the more dense object will displace a greater volume of water. Then, the density of each objects can be calculated either by weighing the object before and after submersion or by measuring the volume of water displaced. In evaluation of body fat content, it is known that body fat is less dense than lean body mass.

The density of fat at 36°C is approximately 0.9007 and the density of the non fat body has been estimated to be 1.10 since fat is less dense than lean body mass, the greater the proportion of fat in the body, the smaller is the body density