REVIEW OF LITERETURE ON NUTRITIONAL ANTHROPOMETRY

A THESIS

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By

HAFIZE MOHAMED AHMED EL HOWARY

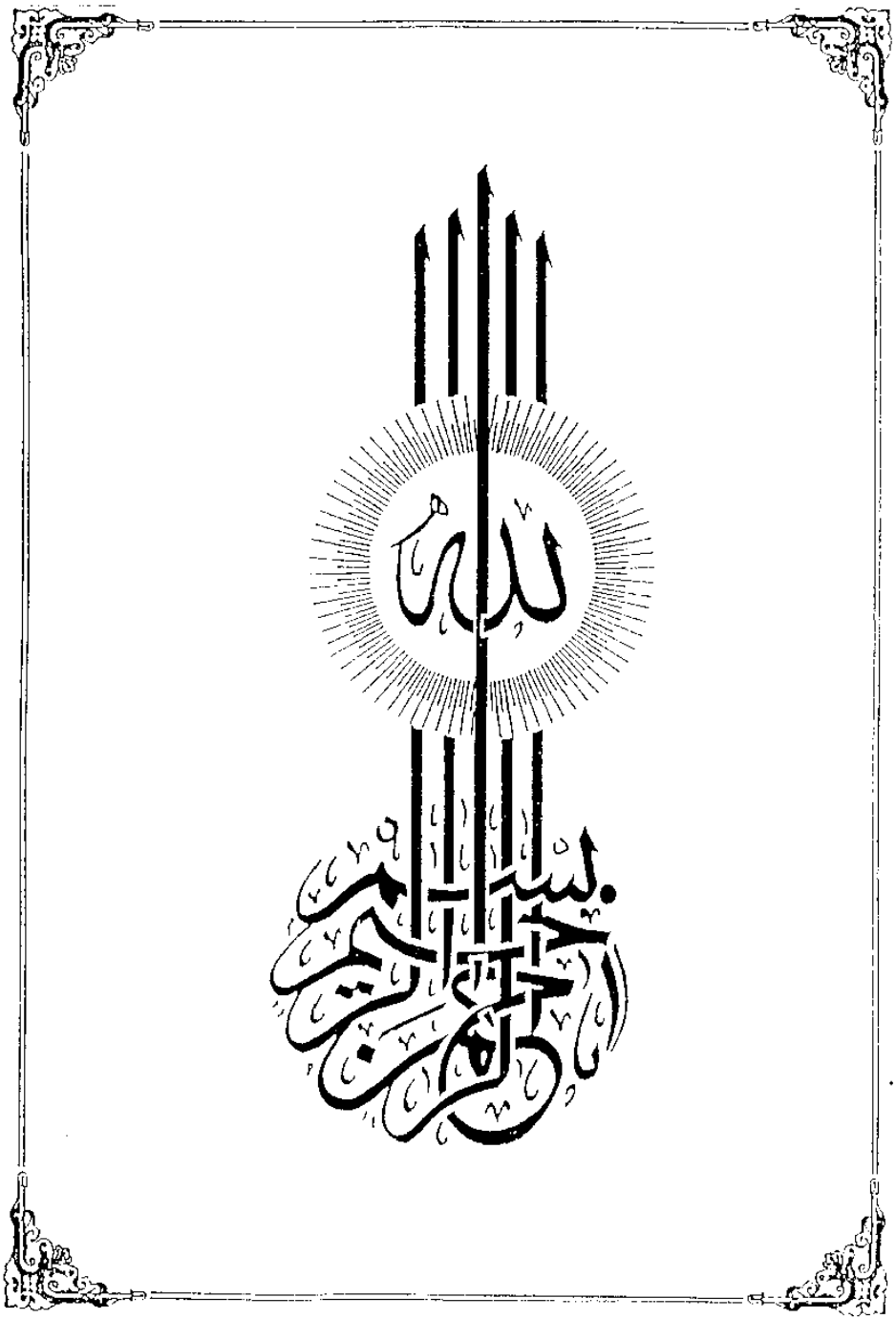
M. B., B. Ch.

Supervised By

Professor Dr. ABD EL-KHALIK KHATTAB

M. D. (Ain Shams) Ph. D. (ED.),
F. R. C. P (ED) M. R. C. P (Glasgow)
Professor of Paediatrics,
Faculty of Medicine,
Ain Shams University,

1981



A C K N O W L E D G E M E N T

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CONTENTS

INTRODUCTION

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Nutritional disorders, under-and overnutrition are common in developing and developed countries respectively. It is the childhood period which coincides with the highest incidence of malnutrition because during such a period all nutrients must be provided not only for energy and tissue replacement but also for growth involving an increase in size of all tissues in the body (Burman, 1976). Therefore, nutritional epidemiologists have long recognized the need for means of assessing various forms of malnutrition widespread in childhood. Such means, include dietary history or survey, clinical examination, laboratory investigations, and anthropometry (Davidson et al., 1975).

Anthropometry as a technique of expressing quantitatively the form of the body, provides a simple, a cheep and a practical method of nutritional assessment (Cameron, 1978). Anthropometry is of value in screening for marginal, subclinical malnutrition as well as in typing and staging of nutritional disorders (Zerfas et al., 1977).

NUTRITION AND NUTRITIONAL STATUS

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Nutrition may be defined as the process by which the organism utilizes food. It determines the nutriture of the body which is the state resulting from the balance between the nutrient intake and the nutrient expenditure. Nutriture is synonymous with nutritional status (Mclaren, 1976).

Adequate nutrition by supplying sufficient nutrients of adequate quantity and quality, contributes to the prevention of acute and chronic illness and the development of physical and mental potentials.

Recommended intakes of nutrients :

Are the amounts sufficient for the nutritional needs of practically all healthy persons in a population. They are related to specific communities and depend upon feeeding habits and physical activity of the community and the climate. Very cold and very hot climates limit physical activity and hence dietary requirements.

There are three major sources of recomended requirements, the first is British (Department of Health and Social Security), the second is American (National Research Council),& the third is

International (WHO) . They do not differ very significantly in most respects and Table 1 . Summarizes the daily recommended requirements of most essential nutrients largely from these sources (Burman, 1976).

Table 1 Recommended intakes of nutrients based on WHO 1973 . All figures for infants and columns marked * from NRC 1974.

	Energy kcal	Energy MJ	Protein g	Thiamine (mg)	Riboflavine mg	Niacin (mg	Vitamin B_6* mg	Vitamin B_{12} µg	Folic acid µg	Ascorbic acid mg
Infants										
Under 6 months	117 kg	0·49 kg	2·2 kg	0·3	0·4	5·0	0·4	0·3	30	35
6–12 months	108 kg	0·45 kg	2·0 kg	0·5	0·6	8·0	0·4	0·3	45	35
Children										
Under 1 year	820	3·4	14	0·3	0·5	5·4		0·3	60	20
1–3 years	1360	5·7	16	0·5	0·8	9·0	0·6	0·9	100	20
4–6 years	1830	7·6	20	0·7	1·1	12·1	0·9	1·5	200	20
7–9 years	2190	9·2	25	0·9	1·3	14·5	1·2	1·5	300	20
Male adolescents										
10–12 years	2600	10·9	30	1·0	1·6	17·2	1·6	2·0	400	20
13–15 years	2900	12·1	37	1·2	1·7	19·1	1·6	2·0	280	30
16–19 years	3070	12·8	38	1·2	1·8	20·3	2·0	2·0	200	30
Female adolescents										
10–12 years	2350	9·8	29	0·9	1·4	15·5	1·6	2·0	400	20
13–15 years	2490	10·1	31	1·0	1·5	16·4	1·6	2·0	200	30
16–19 years	2310	9·7	30	0·9	1·4	15·2	2·0	2·0	200	30

Table *contd.*

	Vitamin A µg**	Vitamin D µg	Vitamin E* (iu)	Calcium g	Calcium* g	Phosphorus* g	Magnesium* mg	Iron mg	Zinc* mg	Iodine* µg
Infants										
Under 6 months	420	10·0	4		0·36	0·24	60	10	3	35
6–12 months	400	10·0	5		0·54	0·40	70	15	5	45
Children										
Under 1 year	300	10·0		0·5–0·6				5–10		
1–3 years	250	10·0	7	0·4–0·5	0·80	0·80	150	5–10	10	60
4–6 years	300	10·0	9	0·4–0·5	0·80	0·80	200	5–10	10	80
7–9 years	400	2·5	10	0·4–0·5	0·80	0·80	250	5–10	10	110
Male adolescents										
10–12 years	575	2·5	12	0·6–0·7	1·20	1·20	350	5–10	15	130
13–15 years	725	2·5	12	0·6–0·7	1·20	1·20	350	9–18	15	130
16–19 years	750	2·5	15	0·5–0·6	1·20	1·20	400	5–9	15	150
Female adolescents										
10–12 years	575	2·5	12	0·6–0·7	1·20	1·20	300	5–10	15	115
13–15 years	725	2·5	12	0·6–0·7	1·20	1·20	300	12–24	15	115
16–19 years	750	2·5	12	0·5–0·6	1·20	1·20	300	14–28	15	115

** Retinol equivalents; 1 µg B carotene = 0·167 µg vitamin A, alcohol (retinol)

DISORDERS OF NUTRITION AND NUTRITIONAL STATUS

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Malnutrition is any disorder of nutrition i.e.,the process by which the organism utilizes food, If the process is excessive, i.e. abnormaly high food intake, overnutrition exists and leads to the state of what might be termed over- or hypernutriture . On the other hand, if the process is deficient for any reason, then undernutrition leads to hyponutriture . Normal nutrition leads to what might be called eunutriture (Mclaren ,1976).

I- Overnutrition and hypernutriture : -

Overnutrition as a nutritional disorder of excessive food intake is common in developed countries and results in hypernutriture "overweight and obesity ".The terms overveight and obesity are not synonymous . Excess weight over a standard (except in very extreme overweight) does not tell us whether the excess weight represents fat, bone, muscle, fluid or the relative contributions of these compo nents . It is confounded by body size and body build . Obesity, on the other hand, refers directly to an excessive accumulation of body fat (Seltzer et al., 1970).

Obesity

Obesity is defined in terms of an increase in the adipose tissue mass, or of an increase in total body fat . The major cause is excessive caloric intake for the daily work load, while endocrine and metabolic disturbances are rare causes of obesity . It has been suggested that childhood obesity is associated with an increased number of adipocytes which remains into adulthood . This type of obesity is in contrast to adult onset obesity, which is associated with an increase in size of fat cells (Gar et al., 1975).

In the childhood obesity, the distribution of fat tends to be generalised and to be associated with less metabolic disorder . However in adult onset obesity the fat distribution tends to be more central and often associated with metabolic disorders such as non-insulin -dependent diabetes mellitus, hyperlipemia or hypertension (Bray et al., 1976).

Classification of Obesity :

Table (2) provides a broad outline of one approach towards classifying obese patients (Bray et al., 1976).

Table 2 —Classification of Obesity

- **Anatomic**
  - Hypercellular
    - With increase in No. of adipocytes and variable degrees of enlargement; onset usually early or late childhood
  - Normocellular
    - With increase in size but not in No. of adipocytes; onset usually in adult years or during pregnancy
- **Etiologic**
  - Endocrine
    - Excess of insulin or of adrenocortical hormones
    - Associated with other endocrine disorder
      - diabetes mellitus, non-insulin-dependent
      - ovarian dysfunction
      - thyroid dysfunction
      - Cushing disease
  - Hypothalamic
  - Genetic
    - Unusual syndromes associated with obesity
    - Familial obesity (reserve for obesity with strong familial incidence)
  - Obesity of undetermined origin

Childhood obesity : -

Obesity is the most frequent nutritional disturbance of childhood in the developed countries and can persist into adult life. Brook et al., (1972) have studied adipose tissue cellularity in a group of obese children . The total number of adipocytes was found to be increased in about half of the children and a retrospective enquiry suggested that those obese children with increased numbers of adipocytes had already become obese during the first year of life .By contrast those obese children with a normal number of adipocytes had only become obese later in childhood . Studies of adipose tissue cellularity in adults have shown that obese adults with increased numbers of cells are likely to have been

obese during childhood . Therefore the capacity for adipose cells to increase their rate of multiplication in respose to overnutrition is greatest in early infancy . During a period of weight loss adipose cell size has been shown to decrease, but cell number remains un changed, at least in the short term (Brook et al., 1972).

An interesting point as regard obesity is the composition of the excess weight, how much of this is fat and how much is lean ?

Forbes (1964) had studied 27 children aged 8 to 18½ years complaining of obesity . Measuremets of total body potassium in those children were made in the whole body scintillation counter, and from this value lean body mass (LBM)was calculated, and then total body fat was calculeted by difference (Fat = wt. - LBM) . A series of normal children was available for comparison . The data strongly suggested that there were two groups of obese children, the first characterized by a definite increase in LBM as well as fat, the second in which the excess body weight was exclusively due to the accumulation of fat . Subjects in the first group tended to be tall, to have advanced bone age, and to have been obese since infancy . On the average, 29% of their excess weight