T.C. ISTANBUL KULTUR UNIVERSITY
INSTITUTE OF SCIENCE AND ENGINEERING

NUTRITIONAL BEHAVIOR IN LIBYA

Master of Science Thesis by
Omar Ali Saieed Moftah

Department: Civil Engineering
Project Management Program

Supervisor: Dr Ali ŞENTÜRK

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Supervisor and Chairperson: Yrd.Doç.Dr. Ali ŞENTÜRK
Members of Examining Committee: Prof. Dr. Zeynep SOZEN
Yrd.Doç.Dr. Murat TURK

Supervisor: Yrd.Doç.Dr. Ali ŞENTÜRK

Prof. Dr. Zeynep SOZEN **Yrd.Doç.Dr. Murat TURK**

Present

To:

My father

Ali

My supervisor

Ali

My son

Ali

1. Introduction

Food is one of the important needs of all living beings. You need food to live. Without food you will not be able to live long. You eat different kinds of foods such as bread, rice, meat, etc. You also take liquid foods like milk, soups and fruit juices. Whatever may be the food, it is made up of small units, which keep you healthy and fit.

One of the saddest features of the modern world is that millions of people do not have enough to eat and many more do not have the right kinds of food required for good health.

In order to be healthy, man needs a balanced diet, i.e. a diet that contains the right amounts of protein, fat, carbohydrate, vitamins and minerals. The carbohydrate in bread, rice, potatoes and sugary foods provides energy for the body. Too much carbohydrate, however, can make people obese and obesity can endanger health. These people usually have serious health problems since they are extremely fat. The oils and fats in milk, cream, butter, cheese and meat provide the body's main stored food and contain much more energy than carbohydrates. The protein in cheese, eggs, meat, fish and milk quickens growth and repair damage to the body's tissues. The body also needs small amounts of vitamins and minerals. When a persons diet consists of a variety of foods, the required amounts of vitamins and minerals are taken in.

Historically, the diets of different societies depend on such factors as climate, soil and the ease or difficulty of transporting foods from one place to another. The simple diet of the Bedouin Arabs consists of dates, grains and sometimes meat and vegetables. This is because the land is very dry and, as a result, very few foods can be grown there. On the other hand, a country such as France, with a good climate and rich soil, has always had plentiful and a great variety of foods.

When people move to another country and culture, they usually take their eating habits with them. They feel psychologically comfortable when they eat the foods they have known all their lives.

When discussing food and diet, it is possible to know a healthy diet contains lots of fruit and vegetables; is based on starchy foods such as wholegrain bread, pasta and rice; and is low in fat (especially saturated fat), salt and sugar.

All food can be separated into three basic types: proteins, carbohydrates and fats. Carbohydrate is the most important food energy provider among the macronutrients, accounting for between 40 and 80 percent of total energy intake.

The nutritional behavior of people is different from place to another place according to the place itself, culture and weather. Some foods are eaten in some places but it is prohibited in another places or undesirable. On another hand, the nutritional behavior effect on the daily needs from nutrients like proteins, vitamins and minerals, which are very necessary for human life. And nutritional behavior affects the health of people, due to its relation with some diseases like fatness and diabetes.

Also world health organization (WHO) and food & agriculture organization (FAO) have general recommendations about healthy nutrition.

Therefore study of nutritional behavior is very important to know if our nutritional behavior is healthy or not.

1.1 Objectives of Study

1. Study of nutritional behavior in some Libyan cities.
2. Knows types of meals in study places.
3. Estimating meals composition.
4. Calculating meals' calories.
5. Comparing results of study with (WHO/FAO) recommendations.

2. Literature review

2.1 Food types

In a nutshell, the most important diet rule is to eat our food as much as possible whole, live, organic and free of added chemicals.

2.1.1 Whole food

Whole food means that there should be as little refining as possible. To give an example: natural brown rice is the preferred whole food. White rice has the bran and germ removed together with most of its vitamins and minerals. Vitamin B1, for instance, is about 450% higher in brown than in white rice. This means that the body may not use the deficient food efficiently. This can lead to overweight or underweight and poor blood-sugar regulation. The lack of fiber in refined rice contributes to constipation. In varying degrees this also applies to other commonly eaten foods.

However, there is also a downside to some whole foods and in particular to seeds. Seeds contain reactive proteins, called lectins, which are mainly in the outer hull or bran. Individuals with certain blood groups tend to react to specific lectins. Therefore, if we have a sensitive digestion and eat food that is not really suited for us, then refined food tends to cause less immediate problems than whole food.(20)

2.1.2 Live food

'Live' means that the food is still high in vitality and naturally occurring enzymes. These are destroyed when food is heated above 120^0 F. Food has different stages of 'aliveness' or vitality. A dry viable seed is alive but dormant; inhibitors inactivate the enzymes. During soaking and sprouting the seed awakens to full life with an abundance of enzyme activity. Like an embryo, it is at the height of its vital and restorative functions.

Whole meal flour that has not been unduly heated during milling (stone mill) has some residual kind of life, but inhibitors block any enzymes. Enzyme activity will be enhanced and starch predigested during sourdough baking. Live food is basically the same as raw or uncooked food.(20)

2.1.3 Organic food

'Organically grown' food means that it is free of toxic agricultural chemicals and has been grown in good soil without the use of water-soluble fertilizers. Very harmful are nitrogen fertilizers, especially nitrates. Many natural therapists believe that organically grown food is an important part in the successful treatment of degenerative diseases. The term 'organic' is generally understood to mean that such food also has not been irradiated and is free of genetically engineered components and any added chemicals that are normally used during storing or processing.(20)

2.1.4 Cooking food

Cooking makes some foods more easily digestible by breaking down cellulose in plant food and connective tissue in meat This enables our digestive juices to get more easily to the nutrients and is especially important for people with weak digestive organs. A further advantage of cooking is the preservation of food, easier chewing and enhanced flavors.

Steaming is the most recommended method of cooking. You may add sufficient water to cover the bottom of the pot, even without special steaming equipment.

The main disadvantage of all cooking is that it destroys food enzymes and some vitamins. This significantly contributes to more rapid aging and the development of degenerative diseases if the diet consists predominantly of cooked food. Therefore try to use only a minimum of cooked food. Most harmed by cooking are animal products and polyunsaturated oils; least harmful are cooked starches.(20)

2.2 The Glycemic Index (G.I.)

The G.I. lists foods according to the increase in blood glucose levels caused by the carbohydrate content 2 – 3 hours after eating. A high G.I. means a rapid increase in blood glucose levels and vice versa. Theoretically it is preferable to eat mainly low G.I. foods that produce a small or slow rise in blood sugar. Fats and proteins do not directly cause a rise in the blood sugar level. If you select your carbohydrates according to the following rules than you do not need to be concerned with the G.I.:

- Eat mainly legumes and vegetables
- Eat (fresh) fruits on their own and not with or after meals
- Minimise sweetened food, grains and cereals.(3)

2.3 Food groups

Cereals: Every day, on the average, should include about eight servings of cereals and cereal products, preferably non-refined ones, including bread. This guideline is not difficult to accommodate, even in the contemporary diet, individuals still consume a lot of bread. Non-refined cereals and their products provide a considerable amount of fiber, which is a desirable attribute. (4, 25)

Sugars: Simple sugars are plentiful in deserts, and also exist, or are added, in beverages, like coffee, tea, fruit juices, soft drinks and colas. They are also naturally found in many fruits. Simple sugars have glycaemic effects mainly comparable to or less than those of starch from cooked foods. Reduction of sugar intake can be accomplished through training during the early years of life. The use of sugar substitutes, such as saccharine and aspartame, has not been linked to human risk, but avoidance of excess consumption may be prudent. (4, 25)

Vegetables and fruits: Every day, on the average, should include about six servings of vegetables and three servings of fruits. There is no risk in the excess intake of vegetables or fruits, so long as energy expenditure balances energy intake. Vegetables and fruits provide a considerable amount of fiber, several micronutrients (potassium, calcium, vitamin C, vitamin B6, carotenoids vitamin E, folate), as well as other

compounds with antioxidant potential. Vegetables can be consumed either cooked in olive oil, or raw in the form of salads.(4, 25)

Herbs: Basil, thyme and other herbs are a good source of antioxidant compounds and can be a tasteful substitute for salt in the preparation of various dishes.(4, 25)

Meat and eggs: Consumption of poultry, eggs and red meat should not exceed on the average one serving per day, and further reduction does not appear to compromise good health among adults. Poultry is much preferred over red meat, and eggs, including those used for cooking or baking, should not exceed 4 per week. So a person may consume 3 eggs and two servings of poultry per week.(4, 25)

Fish and seafood: Fish and seafood could physiologically substitute meat and eggs, but culinary, practical and economic constrains dictate a recommendation of about one serving per day.(4, 25)

Dairy products : Consumption of an average of two servings per day of dairy products, in the form of cheese, traditional yogurt and milk appears compatible to good health.(4, 25)

Pulses: Pulses or legumes (peas, beans and lentils), olive oil allows the preparation of delightful dishes with pulses that share some of the health attributes of vegetables and also provide protein, albeit of moderate quality. Pulses have been described as " the poor man's meat ". Pulses have higher protein content and are good source of the vitamin B group. Consumption of an average of one serving every other day is advised.(4,25)

Added lipids: Olive oil should be preferred over other added lipids, in salads, fried or cooked foods. There is no scientific reason to limit olive oil intake, notwithstanding its high energy content. In a weight reducing diet, increasing physical activity and reducing caloric intake are priorities. Reducing olive oil intake may not be the preferred option if this is to be accompanied by the reduction of vegetable and pulses intake, which are usually prepared with olive oil. (25)

Water: Thirst adequately regulates water intake, except among the elderly and in some pathological conditions. In general terms, the higher the energy consumption and expenditure, the higher the quantity of water needed. Substitution of water with non-alcoholic beverages offers no advantage. (25)

Added substances: Exist of added substances under individual control, notably salt and other condiments. Consumption of salt should be reduced to the culinary acceptable minimum. Most processed foods already contain more salt than needed for physiological purposes.(25)

2.4 Food Composition

The composition of food can vary widely, depending, among other factors, on the variety of plant or animal, on growing and feeding conditions and, for some foods, on freshness. Foods are: cereals, meat& fish, milk & milk products, beverages, vegetables and fruits which are consist of carbohydrates, proteins, lipids, water, vitamins, minerals and enzymes.(21)

2.4.1 Carbohydrates

Carbohydrates are the single most important source of food energy in the world. They comprise some 40 to 80 percent of total food energy intake, depending on locale, cultural considerations or economic status. Those persons with high carbohydrate diets are often in the lower economic strata as foods high in carbohydrate, such as cereal grains, are most often the least expensive. Rice is an excellent example and is the primary staple in the diet of much of the world's population. (6) Food carbohydrates are not only an energy source, however, they have other roles as well. Typically, sugars are used as sweeteners to make food more palatable and to assist in food preservation. Diets high in carbohydrate may reduce individual propensity to obesity, and there is some evidence that such diets may also provide some protection against various non-communicable human diseases and conditions.(4)

2.4.1.1 Description of Carbohydrates

Carbohydrates are polyhydroxy aldehydes, ketoses, alcohols, acids, their simple derivatives and their polymers having linkages of the acetyl type. They may be classified according to their degree of polymerization and may be divided initially into three principal groups, namely sugars, oligosaccharides and polysaccharides (see Figure 1).(13)

Each of these three groups may be subdivided on the basis of the monosaccharide composition of the individual carbohydrates. Sugars comprise monosaccharides, disaccharides and polyols (sugar alcohols); oligosaccharides include malto-oligosaccharides, principally those occurring from the hydrolysis of starch, and other oligosaccharides, e.g. α-galactosides (Raffinose, Stachyose etc.) and fructo-oligosaccharides; the final group are the polysaccharides which may be divided into starch (I-glucans) and non-starch polysaccharides of which the major components are the polysaccharides of the plant cell wall such as cellulose, hemi cellulose and pectin .(13,21)

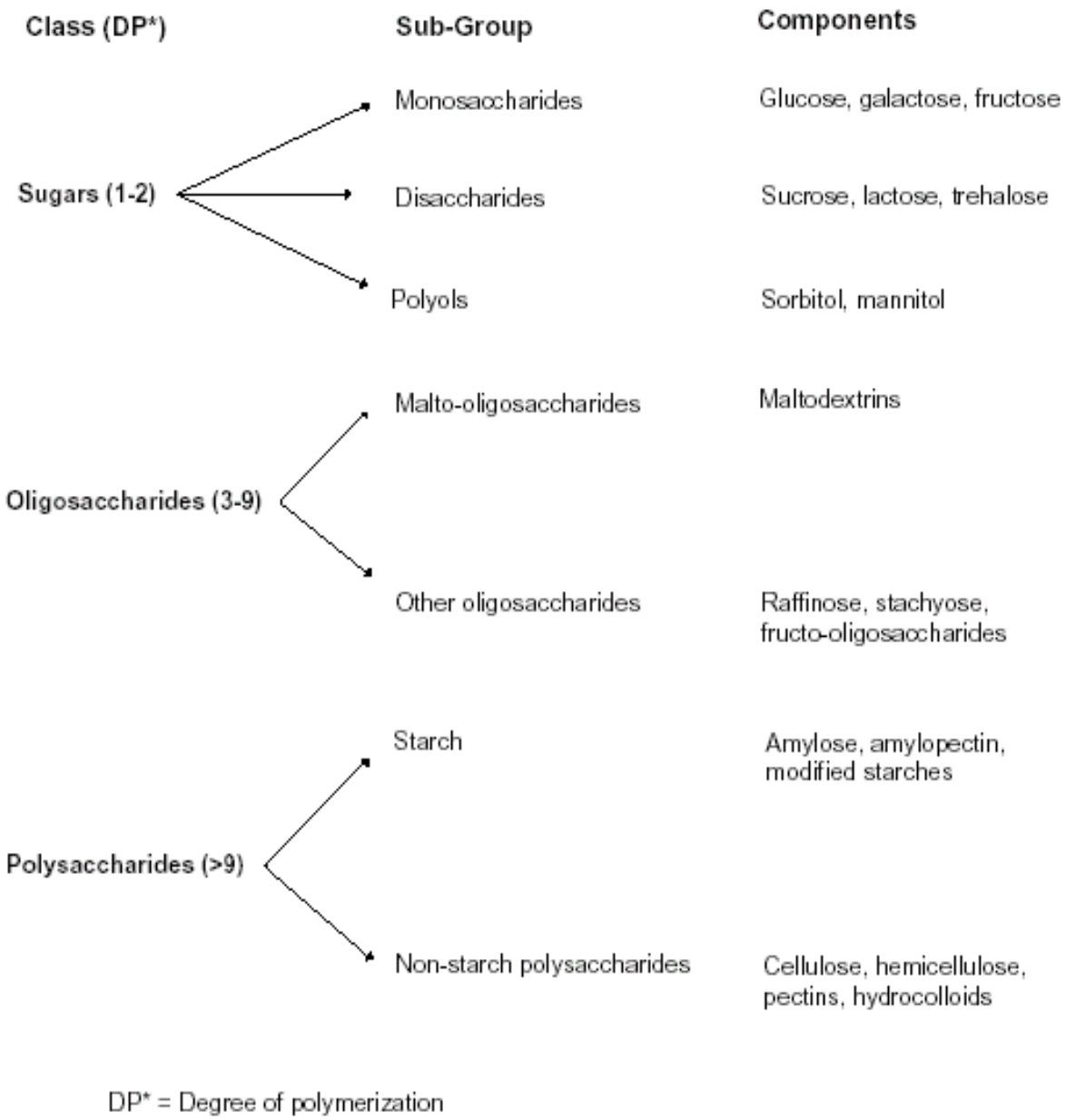
2.4.1.2 Sources of carbohydrates

Food production statistics like food balance sheets (appendix 12), which are available from FAO for every country in the world and for every crop, are useful for examining trends in consumption (13). From these data it can be seen that the major sources of carbohydrate in the human diet are:

1. Cereals
2. Root crops
3. Sugar crops
4. Pulses
5. Vegetables
6. Fruit
7. Milk products

Figure 1

The major dietary carbohydrates



DP* = Degree of polymerization

Source (13)

2.4.1.3 Carbohydrates Physiological effects

Carbohydrates have a wide range of physiological effects, which may be important to health, such as: (4, 13)

- Provision of energy
- Effects on satiety/gastric emptying
- Control of blood glucose and insulin metabolism
- Protein glycosylation
- Cholesterol and triglyceride metabolism
- Bile acid dehydroxylation
- Fermentation- Hydrogen/methane production
  Short-chain fatty acids production
  Control of colonic epithelial cell function
- Bowel habit/laxation/motor activity
- Effects on large bowel micro flora

2.4.1.4 Carbohydrates in the diet

Carbohydrate provides the majority of energy in the diets of most people. There are many reasons why this is desirable. In addition to providing easily available energy for oxidative metabolism, carbohydrate-containing foods are vehicles for important micronutrients. Dietary carbohydrate is important to maintain glycemic homeostasis and for gastrointestinal integrity and function. Unlike fat and protein, high levels of dietary carbohydrate, provided it is obtained from a variety of sources, are not associated with adverse health effects. Diets high in carbohydrate as compared to those high in fat, reduce the likelihood of developing obesity and its co-morbid conditions. An optimum diet should consist of at least 55% of total energy coming from carbohydrate obtained from a variety of food sources.(13)

The consultation agreed that when carbohydrate consumption levels are at or above 75% of total energy there could be significant adverse effects on nutritional status by the exclusion of adequate quantities of protein, fat and other essential nutrients. In arriving at its recommendation of a minimum of 55% of total energy from carbohydrate, the consultation realized that a significant percentage of total energy needs to be provided by protein and fat, but that their contribution to total energy

intakes will vary from one country to another on the basis of food consumption patterns and food availability.(13)

2.4.1.5 FAO/WHO Recommendations on carbohydrates.

The following recommendations are derived from the Consultation discussions and resulting conclusions detailed in the report (12). Specific recommendations are grouped under the appropriate report headings.

The role of carbohydrates in nutrition

1. That the terminology used to describe dietary carbohydrate be standardized with carbohydrates classified primarily by molecular size (degree of polymerization or DP). Further subdivision can be made on the basis of monosaccharide composition. Nutritional groupings can then be made on the basis of physiological properties.
2. That the energy value of all carbohydrate in the diet be reassessed using modern nutritional and other techniques. However, for carbohydrates that reach the colon, the Consultation recommends that the energy value be set at 2 kcal/g (8 kJ/g) for nutritional and labeling purposes.
3. That the continued production and consumption of root crops and pulses be encouraged to ensure the adequacy and diversity of the supply of carbohydrate.
4. That the continued consumption of traditional foods rich in carbohydrate should be encouraged where populations are in transition from a subsistence rural economy to more prosperous urban lifestyles. Processed foods are likely to be a substantial part of the diet and processing can be used to optimize nutritional properties.

The role of carbohydrates in the maintenance of health

5. That the many health benefits of dietary carbohydrates should be recognized and promoted. Carbohydrate foods provide more than energy alone.

6. An optimum diet of at least 55 percent of total energy from a variety of carbohydrate sources for all ages, except for children under two years. Fat should not be specifically restricted below the age of two years. The optimum diet should be introduced gradually beginning at two years of age.
7. That energy balance be maintained by consuming a diet containing at least 55 percent total energy from carbohydrate from various sources, and engaging in regular physical activity.
8. Against consuming carbohydrate levels above the optimum, including carbohydrate-containing beverages, for purposes of recreational physical activity. Higher carbohydrate intakes are only needed for long-term extreme endurance physical activities.
9. That, as a general rule, a nutrient-dense, high-carbohydrate diet be considered optimal for the elderly, but that individualization is recommended because their specific nutritional needs are complex.

Dietary carbohydrate and disease

10. That a wide range of carbohydrate-containing foods be consumed so that the diet is sufficient in essential nutrients as well as total energy, especially when carbohydrate intake is high.
11. That the bulk of carbohydrate-containing foods consumed be those rich in non-starch polysaccharides and with a low glycaemic index. Appropriately processed cereals, vegetables, legumes and fruits are particularly good food choices.
12. That excess energy intake in any form will cause body fat accumulation, so that excess consumption of low-fat foods, while not as obesity producing as excess consumption of high-fat products, will lead to obesity if energy expenditure is not increased. Excessive intakes of sugars, which compromise micronutrient density, should be avoided. There is no evidence of a direct involvement of sucrose, other sugars and starch in the etiology of lifestyle-related diseases.

13. That national government provides populations in transition from traditional diets to that characteristic of developed countries with dietary recommendations to ensure nutritional adequacy and retention of an appropriate balance of macronutrients.

The role of the glycaemic index in food choice

14. That, for healthful food choices, both the chemical composition and physiological effects of food carbohydrates be considered, because the chemical nature of the carbohydrates in foods does not completely describe their physiological effects.
15. That, in making food choices, the glycaemic index be used as a useful indicator of the impact of foods on the integrated response of blood glucose. Clinical application includes diabetes and impaired glucose tolerance. It is recommended that the glycaemic index be used to compare foods of similar composition within food groups.
16. That published glycaemic response data be supplemented where possible with tests of local foods as normally prepared, because of the important effects that food variety and cooking can have on glycaemic responses.(12)

2.4.2 Lipids (Fats and oils)

Fat is major source of fuel energy for the body and aid in the absorption of fat-soluble vitamins and carotenoids. Dietary fat includes all of the lipids in plant and animal tissue, which are eaten as food. The most common fats (solid) or oils (liquid) are a mixture of triacylglycerols (triglyceride) with minor amounts of other lipids. The fatty acids present in various lipid molecules are the moieties of great nutritional interest.(6)

2.4.2.1 Description of Lipids

Fatty acids: the most abundant fatty acids have straight chains of an even number of carbon atoms. There is a wide spectrum of chain-lengths, ranging from a four-carbon fatty acid in milk to thirty-carbon fatty acids in some fish oils. Frequently, the fatty acids have eighteen carbons. Double bonds along the carbon chain or substituents on it are designated chemically by counting the carboxyl carbon as position 1. (5)

Some dietary fatty acids are provided in Table (1).

Acylglycerides. The type of fatty acid and the position in which it is esterifies to glycerol determine the characteristics of acylglycerides. In addition to glycerides, which have three esterifies fatty acids, diacylglycerides (diglycerides) and monoacylglycerides (monoglycerides) occur in raw food or food ingredients (Figure -2 -).(5)

There is some specificity in the position occupied by the fatty acids. Animal depot fats tend to have a saturated fatty acid in position 1 and an unsaturated fatty acid in position 2. Fatty acids in position 3 appear to be more randomly distributed, although polyunsaturated fatty acids often accumulate there.

Saturated Fats: saturated fats come from animal foods (meat, cheese, eggs, dairy) and a few oils like palm kernel oil. These fats are not essential to health - in fact, if consumed in excess, they can be difficult to metabolize (causing weight gain) and may lead to narrowing of the arteries (causing heart disease).

Unsaturated Fats: these include Mono-unsaturated fats and Poly-unsaturated fats.

Mono-unsaturated Fats: mono-unsaturated fat is considered to be one of the healthiest types of general fat. It is found mainly in olive oil, rapeseed oil, canola oil, nuts and seeds. The high consumption of olive oil in Mediterranean countries is considered to be one of the reasons why these countries have lower levels of heart disease. This is because mono-unsaturated fat helps reduce harmful low-density lipoproteins (LDLs), which can cause blocked arteries.(5)

Poly-unsaturated Fats: although much healthier than saturated fat, poly-unsaturated fat is considered to be less healthy than mono-unsaturated fat. This is because research indicates it may reduce the protective high-density lipoproteins (HDLs) as well as the harmful low-density lipoproteins (LDLs). However, within the polyunsaturated fats group are two very important essential fatty acids (EFAs):

- **Omega 6 Fatty Acids** (e.g. linoleic acid): Found in unrefined safflower, corn, sesame and sunflower oils
- **Omega 3 Fatty Acids** (e.g. alpha-linolenic acid): Found in oily fish, linseed or flax oil, hemp oil, soybean oil, pumpkin seeds, walnuts, dark green vegetables.(5)

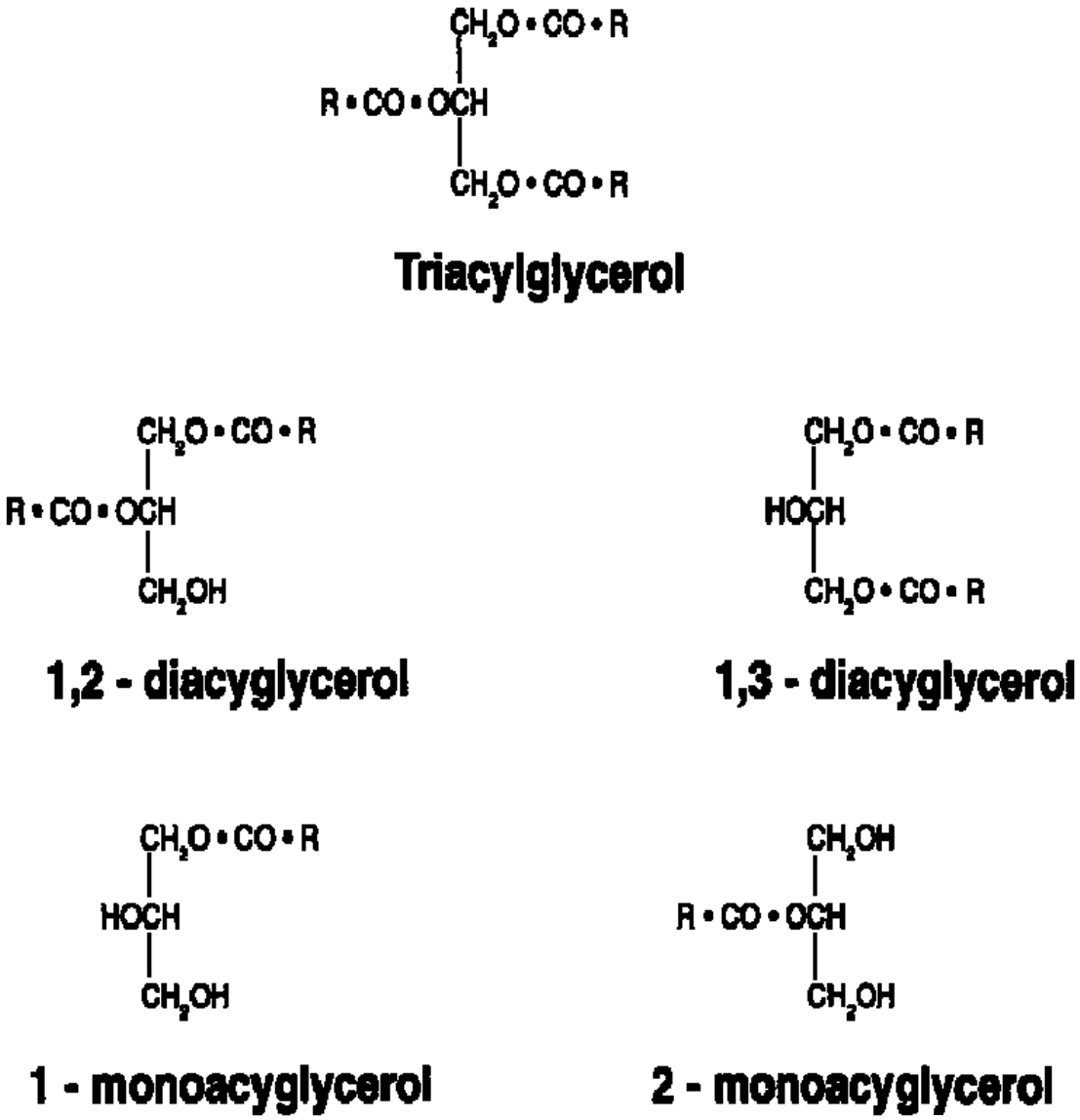
Both these essential fatty acids are vital for good health. They regulate mental health, growth and vitality and are believed to assist the transport and uptake of oxygen throughout the body. EFA deficiency is associated with cardiovascular disease, cancer, diabetes, multiple sclerosis and other degenerative conditions.(5)

Balance between Omega 6 and Omega 3: the optimum balance between these two EFAs in our diet is considered to be three-omega 6 to one omega 3. This contrasts with the current balance in the average Western diet of 10 or 20-1 in favor of omega 6. i.e. eat more omega 3.(5)

Table 2.1 some dietary fatty acids

Common name	Abbreviation	Fatty acid family
Capric	10:0	
Lauric	12:0	
Myristic	14:0	
Palmitic	16:0	
Stearic	18:0	
Arachidic	20:0	
Behenic	22:0	
Lignoceric	24:0	
Palmitoleic	16:1	n-7
Oleic	18:1	n-9
Gadoleic	20: 1	n-9
Cetoleic	22:1	n-11
Erucic	22: 1	n-9
Nervonic	24:1	n-9
Linoleic	18:2	n-6
α -linolenic	18:3	n-3
γ -linolenic	18:3	n-6
Dihomo-γ -linolenic	20:3	n-6
	20:3	n-9
Arachidonic	20:4	n-6

Figure 2.2 Acylglycerides



2.4.2.2 Sources of lipids

The fat content of foods can range from very low to very high in both vegetable and animal products, as indicated in Table -2 -. In non-modified foods, such as meat, milk, cereals and fish, the lipids are mixtures of many of the compounds, with triglycerides making up the major portion. The fats and oils used for making fabricated foods, such as margarine, shortening, etc., are almost pure triglyceride mixtures. Fats are sometimes divided into visible and invisible fats. The fats and oils can be classified broadly into the following groups: animal depot fats, ruminant milk fats, marine oils and vegetable oils. (9)

2.4.2.3 FAO/WHO Recommendations on lipids

Recommendations on minimum intakes of adults*:*

- For most adults, dietary fat should supply at least 15 percent of their energy intake.
- Women of reproductive age should consume at least 20 percent of their energy from fat.
- Concerted efforts should be made to ensure adequate consumption of dietary fat among populations where less than 15 percent of the dietary energy supply is from fat.(14)

Recommendations regarding infant and young child feeding*:*

- Infants should be fed breast-milk if at all possible.
- The fatty acid composition of infant formulas should correspond to the amount and proportion of fatty acids contained in breast-milk.
- During weaning and at least until two years of age, a child's diet should contain 30-40 percent of energy from fat and provide similar levels of essential fatty acids as are found in breast-milk. (14)

Recommendations on upper limits of dietary intakes:

- Active individuals who are in energy balance may consume up to 35 percent of their total energy intake from dietary fat if their intake of

essential fatty acids and other nutrients is adequate and the level of saturated fatty acids does not exceed 10 percent of the energy they consume.

- Sedentary individuals should not consume more than 30 percent of their energy from fat, particularly if it is high in saturated fatty acids, which are derived primarily from animal sources.(14)

Recommendations on intakes of saturated and unsaturated fatty acids:

- Intakes of saturated fatty acids should provide no more than 10 percent of energy.
- Desirable intakes of linoleic acid should provide between 4 and 10 percent of energy. Intakes in the upper end of this range are recommended when intakes of saturated fatty acids and cholesterol are relatively high.
- Reasonable restriction of dietary cholesterol (less than 300 mg/day) is advised. (14)

Table 2.2 Fat content of some foods

Product	Fat (%)
Asparagus	0.25
Oats	4.4
Barley	1.9
Rice	1.4
Walnut	58
Coconut	34
Peanut	49
Soybean	17
Sunflower	28
Milk	3.5
Butter	80
Cheese	34
Hamburger	30
Beef cuts	10-30
Chicken	7
Ham	31

Source: (6)

2.4.3 Proteins

2.4.3.1 Description of proteins

The proteins are polymers of some 21 different amino acids joined together by peptide bonds. Because of the variety of side chains occurring when these amino acids are linked together, the different proteins may have different chemical properties and also widely different secondary and tertiary structures.(6)

Amino acids: Isoleucine, Leucine, Lysine, Methionine, Cystine, Phenylalanine, Tyrosine, Threonine, Valine, Arginine, Histidine, Alanine, Aspartic acid, Glutamic acid, glutamine, Glycine, Proline, tryptophan, asparagines, hydroxyproline and serine.(6)

2.4.3.2 Sources of protein

Proteins occur in animal as well as vegetable products in important quantities. In the developed countries, people obtain much of the protein in the form of animal products. In other parts of the world the major part of the dietary protein is derived from plant products. Many plant proteins are deficient in one or more of the essential amino acids. The protein content of some selected foods is listed Table –3- (6)

2.4.3.3 Proteins in diet

Although man's need for protein and its amino acids are rather stringent, his method of fulfilling his need varies considerably in different parts of the world. Primarily the difference has depended on the availability of foods. In the tropics many peoples have developed dietary patterns based primarily on plant foods with the cereals most abundant. In most of these diets animal protein in the form of meat, fish, eggs, and milk is added when available. Although it is difficult to build an optimum diet on plant products alone, it is possible if the diet is varied.

Many of the proteins present in plant tissues are deficient in one or more of the essential amino acids. For example, zein, one of the proteins of corn, is lacking in lysine and tryptophan; while gliadin, one of the proteins of wheat, is low in lysine. However, both wheat and corn contain other proteins that possess these amino acids. A diet restricted entirely to wheat or to corn is low in lysine and, under the stringent

demands for rapid synthesis, is inadequate, If the wheat or corn is supplemented with proteins that are relatively rich in lysine, then the amino acids supplied are adequate.(21)

2.4.3.4 Physiological needs

Proteins in the diet supply the amino acids required for the growth of young animals, infants and children and also those needed for the maintenance of the tissues in adults. The amounts needed for growth are much greater than those for maintenance. The newborn human infant probably needs about five times as much protein as the adult per unit of weight. As the child develops the rate of growth slows down and so the need for protein is progressively reduced, but until after puberty it remains larger than the adult's. Protein deficiency in children is widespread in Africa. Asia and Latin America as kwashiorkor but in adults is much less frequently found. If the energy content of the diet is inadequate protein is used to supply energy. In consequence protein deficiency is much more likely to occur if a diet is lacking in energy.(4)

2.4.3.5 Protein intakes

League of nations standards: The League of Nations Technical Committee on Nutrition (1936) was the first authoritative body to attempt to lay down a standard. Committee recommended that adults should have at least 1 g of protein/kg body weight/day.

FAO/WHO standards: for an adult man's requirement of protein are 53 g/day or 0.57 g/kg/day or 7 per cent of the energy intake.

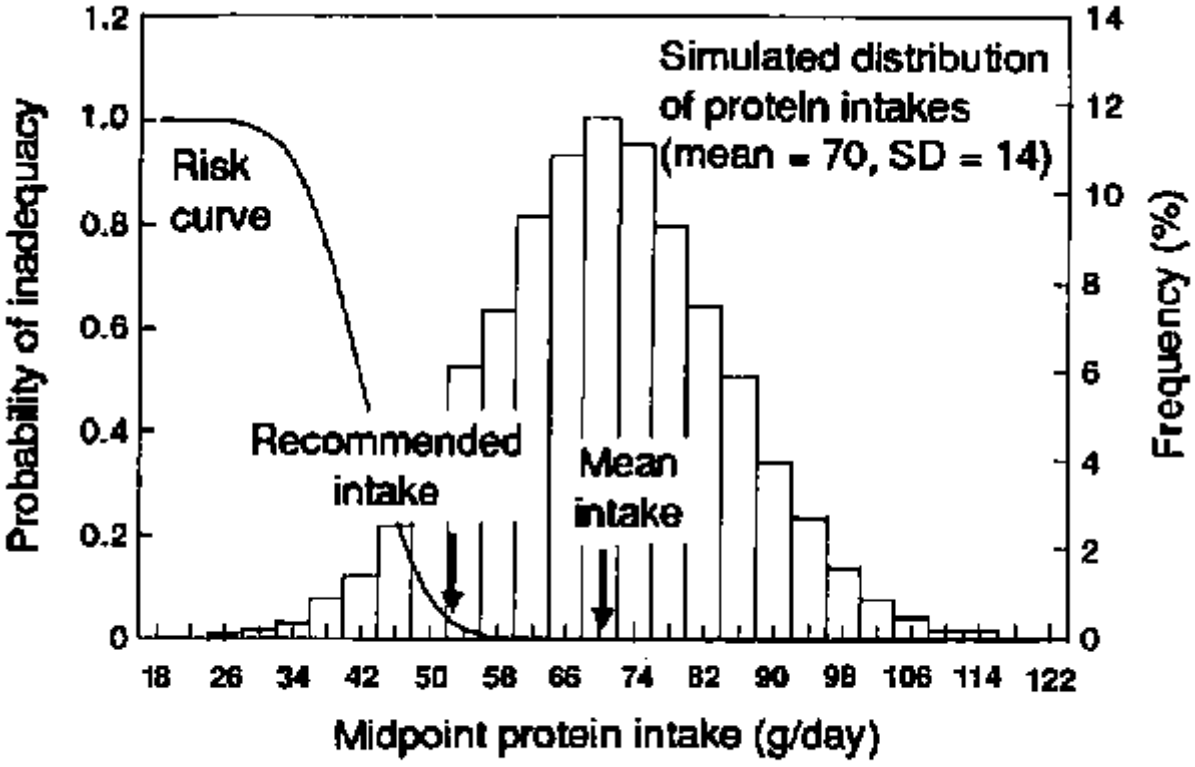
British standards: recommended intakes of protein linked to intakes of dietary energy- For adults a protein intake equivalent to at least 10 per cent of the dietary intake was recommended.(4)

Table 2.3 the protein content of some selected foods

Product	Protein (g/100g)
Meat: beef	16.5
Pork	10.2
Chicken (light meat)	23.4
Fish: haddock	18.3
Cod	17.6
Milk	3.6
Egg	12.9
Wheat	13.3
Bread	8.7
Soybeans: dry, raw	34.1
Cooked	11.0
Peas	6.3
Beans: dry, raw	22.3
Cooked	7.8
Rice: white, raw	6.7
Cooked	2.0
Cassava	1.6
Potato	2.0
Corn	10.0

Source: (6)

Figure 2.3 protein intake in adult men



Source: Based on FAO/WHO/UNU, 1985

2.4.4 Water

Water is an essential constituent of many foods. It may occur as an intracellular and/or extra cellular component in vegetable and animal products, as a dispersing medium or solvent in a variety of products, as the dispersed phase in some emulsified products such as butter and margarine, arid as a minor constituent in other cases. Thus the water content of foods may fall within a very wide range as indicated by the products and their water contents listed in Table - 4 -.

Because of the importance of water as a food constituent, an understanding of its properties and behavior in foods is of great importance. The presence of water influences deterioration of foods, both chemical and microbiological. Removal or freezing of water is essential in some methods of food preservation and drying or freezing does this. Fundamental changes in the product may take place in both instances. (4)

2.4.5 Minerals

In addition to the major components, all foods contain minerals in varying amounts. The mineral material may be present as inorganic or organic salts, or combined with organic material, as e.g., the phosphorus in phosphoproteins and metals in enzymes. More than 60 elements may be present in foods. It is customary to divide the minerals into two groups, the major salt components and the trace elements. The major salt components include potassium, sodium, calcium, magnesium, chloride, sulfate, phosphate and bicarbonate. The trace elements can be divided into three groups:

(1) Essential nutritive elements, which include Fe, Cu, I, Co, Mn and Zn; (2) nonnutritive, nontoxic elements, including Al, B, Ni, Sn and Cr; and

(3) Nonnutritive, toxic elements, including Hg, Pb, As, Cd and Sb. (4)

Table 2.4 Water Contents of Some Selected Foods

Product	Water (%)
Tomato	95
Lettuce	95
Cabbage	92
Beer	90
Orange	87
Apple juice	87
Milk	87
Potato	78
Banana	75
Chicken	70
Salmon, canned	67
Meat	65
Cheese	37
Bread, white	35
Jam	28
Honey	20
Butter and margarine	16
Wheat flour	12
Rice	12
Coffee bean, roasted	5
Milk powder	4
Shortening	0

Source: (4)

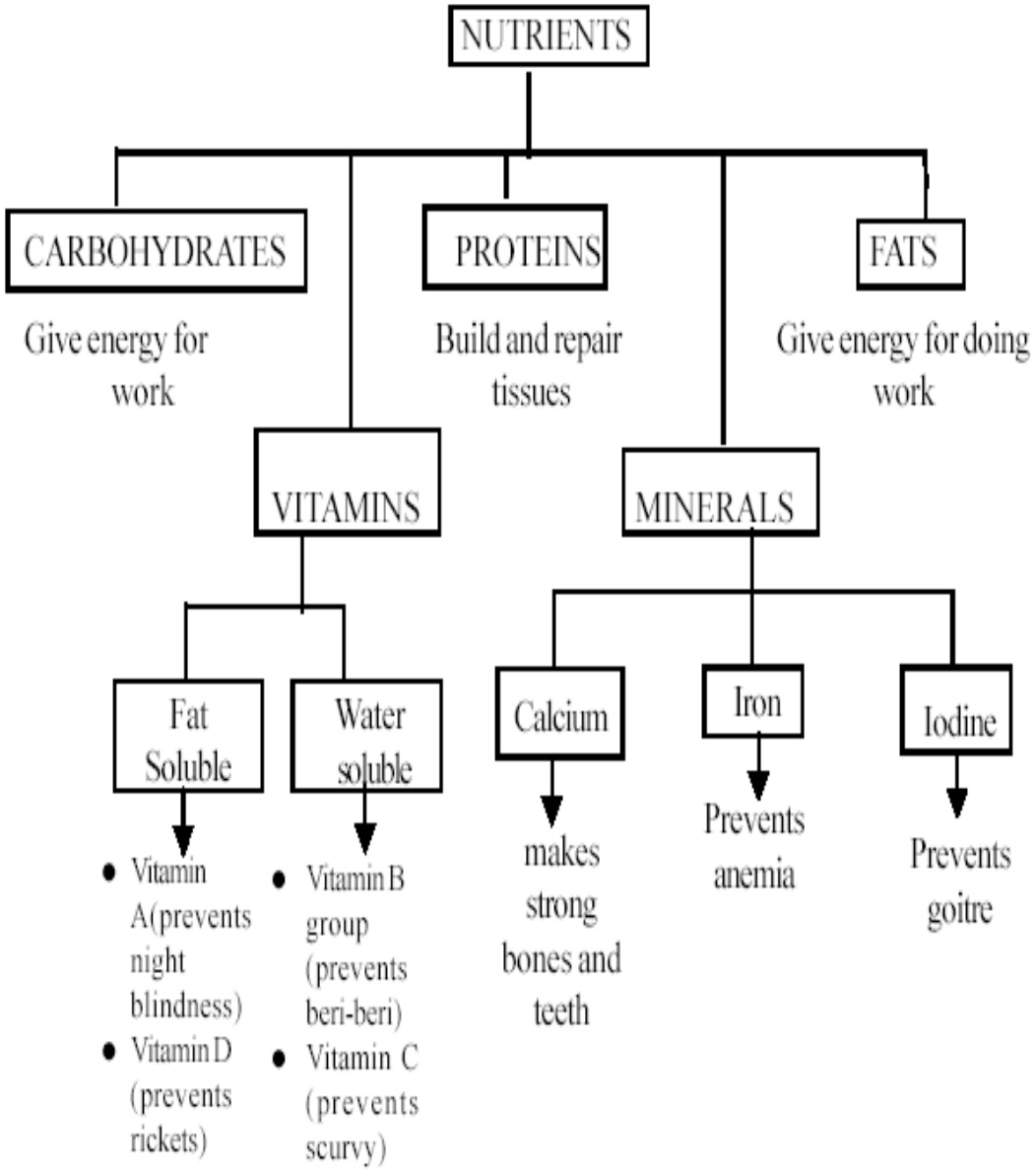
2.4.6 Vitamins

The vitamins are minor components of foods, which play an essential role in human nutrition. Many of the vitamins are unstable under certain conditions of processing and storage and their levels in processed foods, therefore, may be considerably reduced. Synthetic vitamins are used extensively to make up for these losses and to restore vitamin levels in foods. The vitamins are usually divided into two main groups, the water-soluble and the fat-soluble vitamins. The occurrence of the vitamins in the various food groups is related to their water or fat-solubility. Some of the vitamins function as part of a co-enzyme, and play a role in the metabolism of fats, proteins and carbohydrates. Some of the vitamins occur in foods as provitamins, compounds that are not vitamins but can be changed by the body into vitamins. (4)

2.4.7 Enzymes

Enzymes, although minor constituents of many foods, play an important role. Their importance has several reasons. Naturally present enzymes in foods may bring about changes in composition, which in some cases are desirable, but in most instances are undesirable and the enzymes, therefore, have to be inactivated. The blanching of vegetables is an example of the latter type. Some enzymes are used as indicators in analytical methods, such as phosphatase in the phosphatase test of pasteurization of milk. Enzymes are used as processing aids in the manufacturing of foods. An example is the use of rennin, contained in extracts of calves' stomachs, as a coagulant milk used in the production of cheese. (4)

Figure 2.4 basic nutrients of human body



2.5 Energy

Humans and other mammals constantly need to expend energy to perform physical work**,** to maintain body temperature and concentration gradients and to transport synthesize, degrade, and replace small and large molecules that are their constituents. This energy is generated by oxidation of various organic substances**,** primarily sugars, fats, and amino acids. Energy is required to sustain the body's various functions, including respiration, circulation, physical work, and maintenance of core body temperature this energy in food is released in the body by oxidation, yielding the chemical energy needed to sustain metabolism, nerve transmissions, respiration, circulation, physical work. The heat that is also produced during these processes is used to maintenance body temperature. The energy balance of an individual depends on his/ her dietary energy intake and energy expenditure. Imbalances between intake and expenditure result in gains or losses of body components, mainly in the form of fat, and these determine changes in body weight. (3)

The Estimated Energy Requirement (EER) is defined as the dietary energy intake that is predicted to maintain energy balance in a healthy adult of a defined age, gender, weight, height, and level of physical activity consistent with good health.

The carbohydrates, fats, and proteins in food supply energy, which is measured in calories. Carbohydrates and proteins provide 4 calories per gram. Fat contributes more than twice as much 9-calorie per gram. Alcohol is also high in energy and supplies 7 calories per gram. Foods that are high in fat are also high in calories.(23) Table - 5- energy value of some food.

2.5.1 Energy flow of throw the body.

Food that is ingested contains energy - the maximum amount being reflected in the heat that is measured after complete combustion to carbon dioxide (CO_2) and water in a bomb calorimeter. This energy is referred to as ingested energy (IE) or gross energy (GE). Incomplete digestion of food in the small intestine, in some cases accompanied by fermentation of unabsorbed carbohydrate in the colon, results in losses of energy as faecal energy (FE) and so-called gaseous energy (GaE) in the form of combustible gases (e.g. hydrogen and methane). Short-chain (volatile) fatty acids are

also formed in the process, some of which are absorbed and available as energy. Most of the energy that is absorbed is available to human metabolism, but some is lost as urinary energy (UE), mainly in the form of nitrogenous waste compounds derived from incomplete catabolism of protein. A small amount of energy is also lost from the body surface (surface energy [SE]). The energy that remains after accounting for the important losses is known as "metabolically energy" (ME) (Figure5).(10)

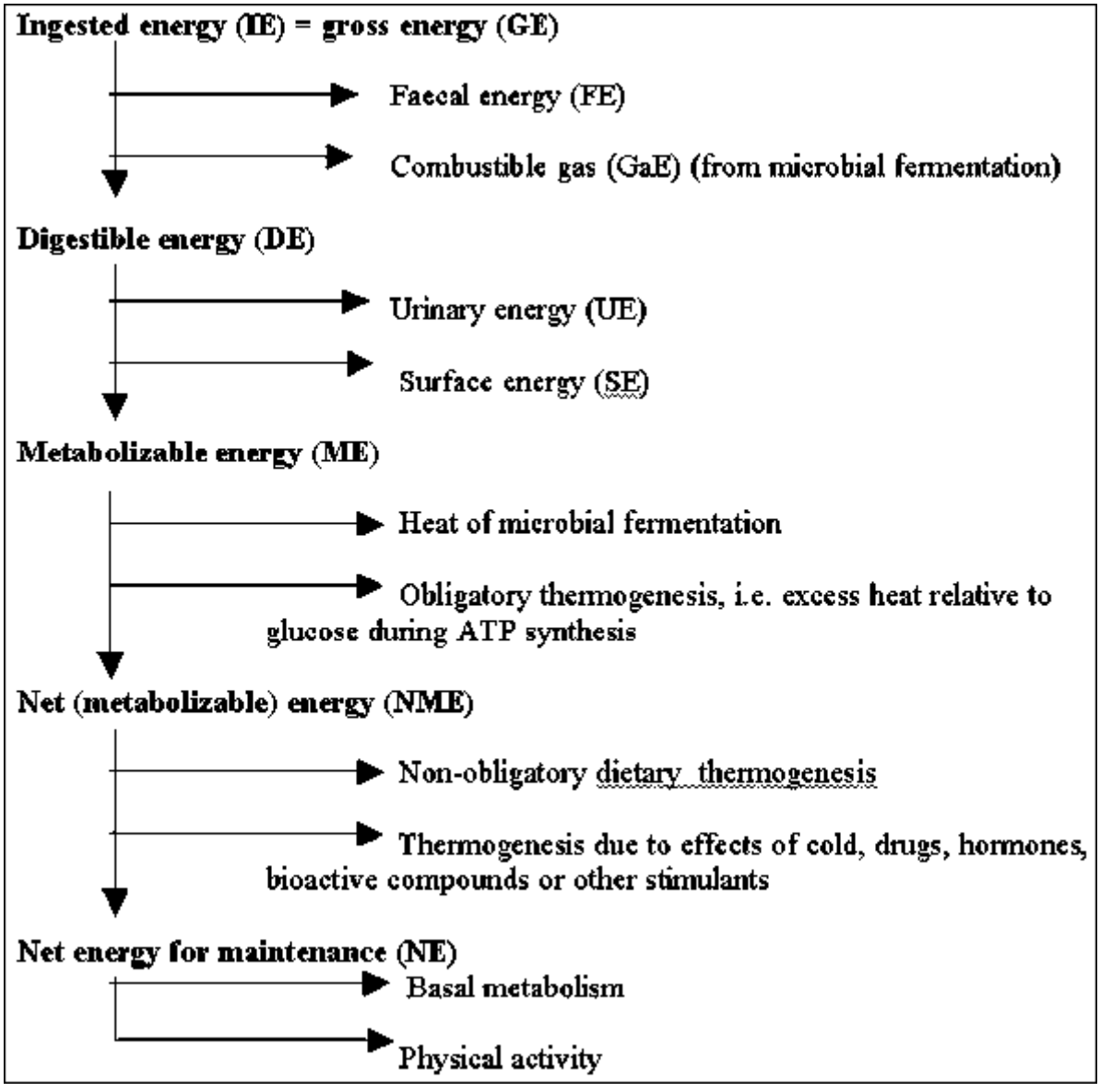
2.5.2 Energy balance

In adults, it is important that the amount of energy ingested be matched to the amount of energy expended. Maintenance of energy balance is important in order to avoid obesity and its associated co-morbidities such as diabetes and cardiovascular disease. Positive energy balance and obesity occur when total energy intake exceeds total energy expenditure, regardless of composition of the excess energy. However, the composition of the diet can affect whether and to what extent positive energy balance occurs.

The composition of the diet can also affect the ability to maintain energy balance. In particular, diets containing at least 55% of energy from a variety of carbohydrate sources, as compared to high fat diets, reduce the likelihood that body fat accumulation will occur. Substantial data suggest that diets high in fat content tend to promote consumption of more total energy than diets high in carbohydrates. This effect may be due to the low energy density of high carbohydrate diets, since total volume of food consumed appears to provide an important satiety cue. There are no data to suggest that different types of carbohydrates differentially affect total energy intake. (13)

The report, titled Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids, is the sixth in a series providing Dietary Reference Intakes (DRIs) developed jointly by American and Canadian scientists, recommends that to meet the body's daily nutritional needs while Minimizing risk for chronic disease, adults should consume 45 to 65 percent of their total calories from carbohydrates, 20 to 35 percent from fat, and 10 to 35 percent from protein. The acceptable ranges for children are similar to those for adults, except that infants and younger children need a somewhat higher proportion of fat in their diets. (19)

Figure 2.5 Overview of food energy flow through the body for maintenance of energy balance



Source: (10)

Table 2.5 Energy value for selected foods

	Protein kcal/g (kJ/g)[§]	**Fat** kcal/g (kJ/g)[§]	**Total carbohydrate** kcal/g (kJ/g)[§]
Eggs, meat products, milk products:			
Eggs	*4.36* (18.2)	*9.02* (37.7)	*3.68* (15.4)
Meat/fish	*4.27* (17.9)	*9.02* (37.7)	*
Milk/milk products	*4.27* (17.9)	*8.79* (36.8)	*3.87* (16.2)
Fats - separated:			
Butter	*4.27* (17.9)	*8.79* (36.8)	*3.87* (16.2)
Margarine, vegetable	*4.27* (17.9)	*8.84* (37.0)	*3.87* (16.2)
Other vegetable fats and oils	--	*8.84* (37.0)	--
Fruits:			
All, except lemons, limes	*3.36* (14.1)	*8.37* (35.0)	*3.60* (15.1)
Fruit juice, except lemon, lime[#]	*3.36* (14.1)	*8.37* (35.0)	*3.92* (15.1)
Lemon, limes	*3.36* (14.1)	*8.37* (35.0)	*2.48* (10.4)
Lemon juice, lime juice[#]	*3.36* (14.1)	*8.37* (35.0)	*2.70* (11.3)
Grain products:			
Barley, pearled	*3.55* (14.9)	*8.37* (35.0)	*3.95* (16.5)
Cornmeal, whole ground	*2.73* (11.4)	*8.37* (35.0)	*4.03* (16.9)
Macaroni, spaghetti	*3.91* (16.4)	*8.37* (35.0)	*4.12* (17.2)
Oatmeal - rolled oats	*3.46* (14.5)	*8.37* (35.0)	*4.12* (17.2)
Rice, brown	*3.41* (14.3)	*8.37* (35.0)	*4.12* (17.2)
Rice, white or polished	*3.82* (16.0)	*8.37* (35.0)	*4.16* (17.4)
Rye flour - whole grain	*3.05* (12.8)	*8.37* (35.0)	*3.86* (16.2)
Rye flour – light	*3.41* (14.3)	*8.37* (35.0)	*4.07* (17.0)
Sorghum - whole meal	*0.91* (3.8)	*8.37* (35.0)	*4.03* (16.9)
Wheat - 97-100% extraction	*3.59* (14.0)	*8.37* (35.0)	*3.78* (15.8)
Wheat t - 70-74% extraction	*4.05* (17.0)	*8.37* (35.0)	*4.12* (17.2)
Other cereals – refined	*3.87* (16.2)	*8.37* (35.0)	*4.12* (17.2)
Legumes, nuts:			
Mature dry beans, peas, nuts	*3.47* (14.5)	*8.37* (35.0)	*4.07* (17.0)
Soybeans	*3.47* (14.5)	*8.37* (35.0)	*4.07* (17.0)
Vegetables:			
Potatoes, starchy roots	*2.78* (11.6)	*8.37* (35.0)	*4.03* (16.9)
Other underground crops	*2.78* (11.6)	*8.37* (35.0)	*3.84* (16.1)
Other vegetables	*2.44* (10.2)	*8.37* (35.0)	*3.57* (14.9)

Source: (10)

2.6 Diet is important to health at all stages of life

Food choices depend on history, culture, and environment, as well as on energy and nutrient needs. People also eat foods for enjoyment. Family, friends, and beliefs play a major role in the ways people select foods and plan meals. Many genetic, environmental, behavioral, and cultural factors can affect health. Understanding family history of disease or risk factors body weight and fat distribution, blood pressure, and blood cholesterol, for example can help people make more informed decisions about actions to improve health. Food choices are among the most pleasurable and effective of these actions. Healthful diets help children grow, develop, and do well in school. They enable young and older adults to work productively and feel their best. Food choices also can help to prevent chronic diseases, such as heart disease, certain cancers, diabetes, stroke, and osteoporosis that are leading causes of death and disability among Americans. Good diets can reduce major risk factors for chronic diseases -- factors such as obesity, high blood pressure, and high blood cholesterol.

Foods contain energy, nutrients, and other components that affect health People require energy and certain other essential nutrients. These nutrients are essential because the body cannot make them and must obtain them from food. Essential nutrients include vitamins, minerals, certain amino acids, and certain fatty acids. Foods also contain fiber and other components that are important for health. Although each of these food components has a specific function in the body, all of them together are required for overall health. People need calcium to make bones, for example, but many other nutrients also take part in building and maintaining bones. The carbohydrates, fats, and proteins in food supply energy, which is measured in calories. Carbohydrates and proteins provide 4 calories per gram. Fat contributes more than twice as much -- 9 calories per gram. Alcohol is also high in energy and supplies 7 calories per gram. Foods that are high in fat are also high in calories. Energy needs vary by age. Older adults, for example, need less food than younger and more active individuals. People who are inactive or trying to lose weight may eat little food and have difficulty meeting their nutrient needs in a satisfying diet. Increasing the energy spent in daily activities helps to maintain health and allows people to eat a nutritious and enjoyable diet.(7)

2.6.1 What is a healthful diet?

Healthful diets contain the amounts of essential nutrients and energy needed to prevent nutritional deficiencies and excesses. Healthful diets also provide the right balance of carbohydrate, fat, and protein to reduce risks for chronic diseases, and they are obtained from a variety of foods that are available, affordable, and enjoyable. (7)

2.7 Daily Values

The Food and Drug Administration have established daily Values as references to help consumers use information on food labels to plan a healthy overall diet. The Daily Values provide a reliable guide for most people. It is helpful to know that a 2,000-calorie level is about right for moderately active women, teenage girls, and sedentary men, and 2,500 calories is the target level for many men, teenage boys, and active women. Many older adults, children, and sedentary women need fewer than 2,000 calories a day and may want to select target levels based on 1,600 calories a day. Some active men and teenage boys and very active women may want to select target levels based on 2,800 calories per day. The Daily Values for sodium and cholesterol are the same for everyone, regardless of total calories consumed, so you do not have to make adjustments based on your caloric needs. (17)

Table 2.6 Daily Values

Nutrient	**Calories**	**2,000**	**2,500**
Total fat	Less than	65 g	80 g
Saturated fat	Less than	20 g	25 g
Cholesterol	Less than	300 mg	300 mg
Sodium	Less than	2,400 mg	2,400 mg
Total carbohydrate		300 g	375 g
Dietary fiber		25 g	30 g
Potassium		3,500 mg	3,500 mg

Source: U.S. Food and Drug Administration (1999)

Table 2.7 Nutritional Values of Commodities -- Per 100 Gram

CEREALS	Kcal	Protein (g)	Fat (g)
Wheat	330	12.3	1.5
Wheat flour	350	11.5	1.5
Bulgur wheat	350	11.0	1.5
Maize	350	10.0	4.0
Maize meal	360	9.0	3.5
Sorghum	335	11.0	3.0
Rice	360	7.0	0.5
Rolled oats	380	13.0	7.0
BLENDED FOODS			
Corn Soya blend (CSB)	380	18.0	6.0
Corn Soya milk (CSM)	380	20.0	6.0
Instant corn Soya blend	365	12.2	4.0
Wheat Soya blend (WSB)	370	20.0	6.0
Soy fortified Bulgur wheat	350	17.0	1.5
Soy fortified corn meal	360	13.0	1.5
Soy fortified rolled oats	375	21.0	6.0
Soy fortified wheat flour	360	16.0	1.3
PULSES			
Dried peas and beans	335	22.0	1.5
Dry Groundnuts	580	27.0	45.0
Fresh Groundnuts	330	15.0	25.0
MILK, CHEESE, and EGGS			
Dried Skim milk (DSM)	360	36.0	1.0
Dried Whole milk (FCM)	500	26.0	27.0
Cheese	355	22.5	28.0
Dried eggs	575	45.5	43.5
MEAT AND FISH			
Canned meat	220	21.0	15.0
Dried salted fish	270	47.0	7.5
Canned fish in oil	305	22.0	24.0
Fish protein concentrate	390	75.0	10.0
OIL AND FATS			
Vegetable oil	885	0	100
Butter oil	860	0	98.0

Margarine	735	0	82.0
Red Palm oil	884	0	100
Edible fat	900	0	100
FRUIT AND BEVERAGE			
Dried fruit	270	4.0	0.5
Dates	245	2.0	0.5
Jam	265	0	0
Tea	0	0	0
Coffee	0	0	0
BISCUITS AND MISCELLANEOUS			
Sugar	400	0	0
Iodized salt	0	0	0
Pasta	365	12.5	1.2
Freeze-dried meat	480	65.0	25.0
Minestrone	500	22.5	27.0
Protein enriched ration	450	16.7	15.5

Source: (27)

2.8 Food digestion

When we eat such things as bread, meat, and vegetables, they are not in a form that the body can use as nourishment. Our food and drink must be changed into smaller molecules of nutrients before they can be absorbed into the blood and carried to cells throughout the body. Digestion is the process by which food and drink are broken down into their smallest parts so that the body can use them to build and nourish cells and to provide energy. (3)

The digestive system is a series of hollow organs joined in a long, twisting tube from the mouth to the anus. Inside this tube is a lining called the mucosa? In the mouth, stomach, and small intestine, the mucosa contains tiny glands that produce juices to help digest food. (4)

There are also two solid digestive organs, the liver and the pancreas, which produce juices that reach the intestine through small tubes. In addition, parts of other organ systems (for instance, nerves and blood) play a major role in the digestive system. Digestion involves the mixing of food, its movement through the digestive tract, and chemical breakdown of the large molecules of food into smaller molecules. Digestion begins in the mouth, when we chew and swallow, and is completed in the small intestine. The chemical process varies somewhat for different kinds of food. (3)

Movement of Food through the System

- Mouth: Seconds
- Esophagus: Seconds.
- Stomach: Up to 3½ hours
- Small Intestine: Minutes
- Large Intestine: Hours

2.8.1 Carbohydrates:

The digestible carbohydrates are broken into simpler molecules by enzymes in the saliva, in juice produced by the pancreas, and in the lining of the small intestine. Starch is digested in two steps: First, an enzyme in the saliva and pancreatic juice breaks the starch into molecules called maltose; then an enzyme in the lining of the small intestine (maltase) splits the maltose into glucose molecules that can be absorbed

into the blood. Glucose is carried through the bloodstream to the liver, where it is stored or used to provide energy for the work of the body. An enzyme in the lining of the small intestine digests sucrose (table sugar**)** into glucose and fructose, each of which can be absorbed from the intestinal cavity into the blood. Milk contains yet another type of sugar, lactose, which is changed into absorbable molecules by an enzyme called lactase, also found in the intestinal lining.(23)

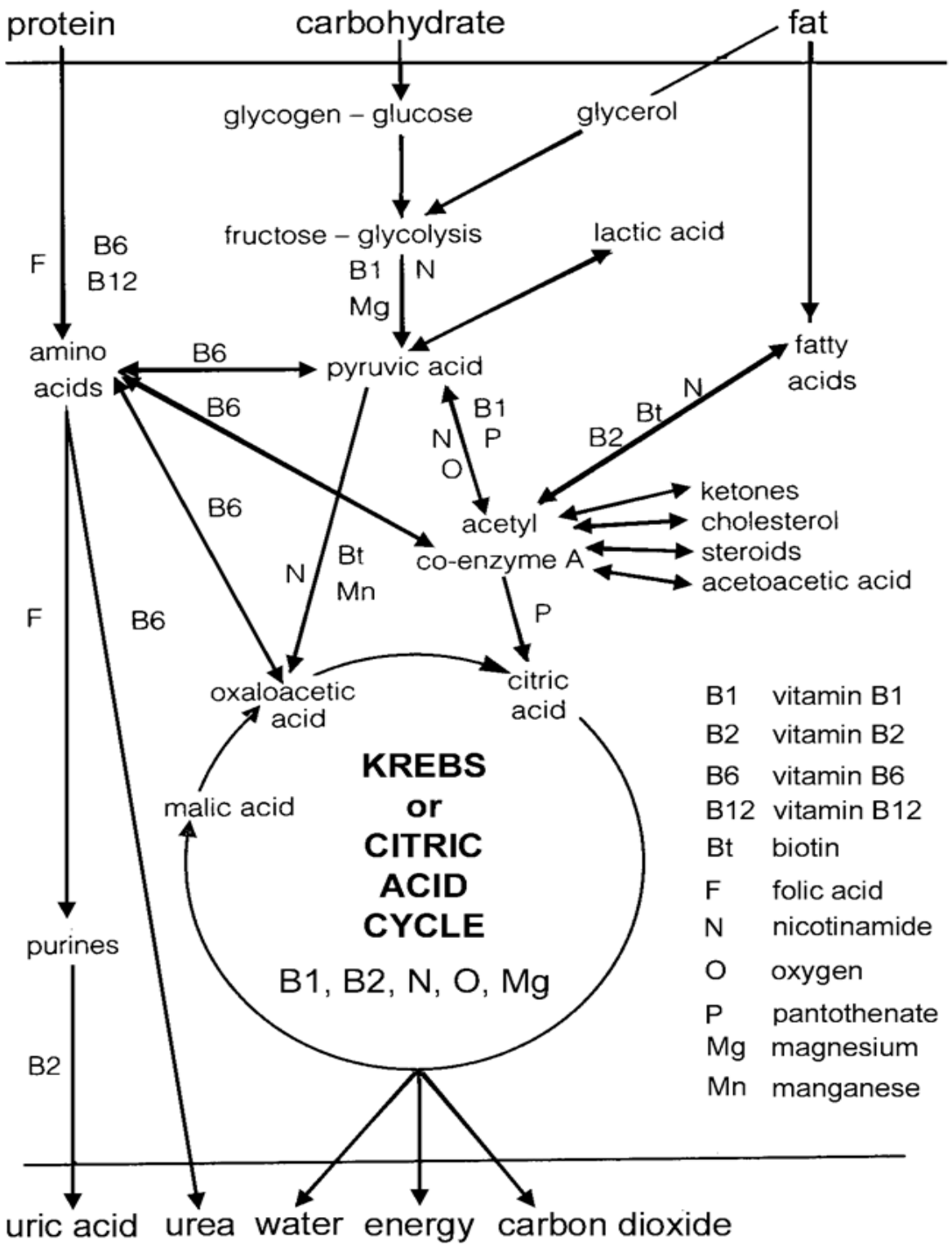
2.8.2 Protein:

Large molecules of protein that must be digested by enzymes before used to build and repair body tissues. An enzyme in the juice of the stomach starts the digestion of swallowed protein. Further digestion of the protein is completed in the small intestine. Here, several enzymes from the pancreatic juice and the lining of the intestine carry out the breakdown of huge protein molecules into small molecules called amino acids. These small molecules can be absorbed from the hollow of the small intestine into the blood and then be carried to all parts of the body to build the walls and other parts of cells.(23)

2.8.3 Fats:

The first step in digestion of a fat is to dissolve it into the watery content of the intestinal cavity. The bile acids produced by the liver act as natural detergents to dissolve fat in water and allow the enzymes to break the large fat molecules into smaller molecules, some of which are fatty acids and cholesterol. The bile acids combine with the fatty acids and cholesterol and help these molecules to move into the cells of the mucosa. In these cells the small molecules are formed back into large molecules, most of which pass into vessels (called lymphatics) near the intestine. These small vessels carry the reformed fat to the veins of the chest, and the blood carries the fat to storage depots in different parts of the body.(23)

Figure 2.6 food metabolism



Source: (3)

2.9 Studies of nutritional behavior in Libya

Aliamor (1974) was study the Libyan food habits and the repetition of household diets by distribute nutritional questionnaires for Al-fatih university's students (114 student), he was found that 50% from responsive eats coscoci and rice once a week and 43% eats macaroni and hasa once a week, results mentioned in table (8). (1)

Ahmed & Abo-aysha (1994) were used consumption weighed method of 123 people to estimating quantities of nutrients and them percent in the energy, table (9). (1)

Ahmed & Sharif (1993) were prepared simple tables of food analysis to estimating nutritional values of foodstuffs modified tables' 10- 11-. (2)

Finally, Moftah (2003) was explaining means of quantities of dietary daily intake from diets during his study to estimate daily intake of lead and cadmium in Libya, appendix - 4 -. (22)

Table 2.8 types and the repetition of Libyan household diets (1974)

Diet	Daily	Once a week	Twice a week	Once a month
Bazine	10	21	14	43
Coscoci	4	49	32	13
Coscoci asloz	5	33	13	28
Macaroni	6	43	37	14
Rice	7	50	26	17
Roshda	3	33	24	29
Shkshoka	5	25	18	43
Hasa	19	42	10	27
Haraemi	6	28	10	40
Braak	13	38	19	19
Tajin	9	47	15	25
Thrieed	6	25	5	50
Acida	4	19	11	53

Source: (1)

Table 2.9 contribution of carbohydrates, fats and protein in energy (%)

Age (Years)	Sex	Carbohydrates (%)	Proteins (%)	Fats (%)
1 – 3	M & F	31	16.3	52.7
4 – 6	M & F	39.1	24.2	36.7
7 – 10	M & F	47.8	19.1	33
11-14	M	51.7	17.8	30.5
15 –18	M	50	16.3	33.7
19 – 22	M	45.9	19.4	34.7
23 – 50	M	55.5	11.6	32.9
+51	M	52.1	14.6	33.2
11-14	F	51.1	12.6	36.2
15 –18	F	48.8	16.4	34.8
19 – 22	F	45.9	15.6	38.4
23 – 50	F	47.7	15.7	36.6
+51	F	54.6	17.8	26.8

Source: (1)

Table2.10 Composition of Libyan household diets (basic contents)

Diet	Gram	Water	Calories	Protein	Fat	Carbohydrate
Macaroni	100	70.7	164	5.4	5.5	17.3
Rice	100	52.7	197	4.62	8.18	33.38
Coscoci	100	58.6	242	7.4	8.03	12.37
Soup diet	100	69.3	130	3.39	12.11	13.83
Shorapa	100	70.5	148	8.85	6.63	12.43
Roshda	100	65.4	195	6.72	7.28	18.72
Fish diets	100	60	211	23.7	13	4
Bazine	100	65	166	7.8	3.53	22.37
Eggs	50	37.7	78	5.8	5.5	0.7
Milk	100	87.4	68	3.5	3	5.5
Bread	80	24.3	226	6.6	0.81	47.2
Total eggs breakfast	230	149.4	372	15.9	9.31	53.4
Cheese	38	22.1	52	7.2	9.2	0.7
Milk	100	87.4	68	3.5	3	5.5
Bread	80	24.3	226	6.6	0.81	47.2
Total breakfast	218	133.8	346	17.3	13.01	53.4
Tuna	85	51.2	170	25	7	0
Bread	80	24.3	226	6.6	0.81	47.2
Total tuna breakfast	165	75.5	396	31.6	7.81	47.2
Banana	200	75.7	116	1.5	0.3	30.2
Apple	125	84.4	73	0.3	0.8	18.1
Melon	160	147	42	0.8	0.3	10.2

Source:(2)

Table2.11 Composition of Libyan household diets (minerals)

Diet	Gram	Ca	Fe	P	K	Na
Macaroni	100	7.4	35.6	1.69	277	263
Rice	100	27.15	21.1	1.27	211	75
Coscoci	100	7.5	28.5	1.12	234	199
Soup diet	100	10	24.7	1.87	384	350
Shorapa	100	20.7	22.3	1.45	345	127
Roshda	100	14.7	333	1.3	0	0
Fish diets	100	41.7	23.15	1.23	275	166
Bazine	100	26.2	19.5	1.21	194	91
Eggs	50	26	1	90	57	54
Milk	100	120	0.1	91	0	85
Bread	80	48	0.49	81	0	0
Total eggs breakfast	230	294	1.5	262	57	139
Cheese	38	93.5	0.15	101	56.5	0
Milk	100	120	0.1	91	0	85
Bread	80	48	0.49	81	0	0
Total breakfast	218	261.5	0.65	273	56.5	85
Tuna	85	7	1.6	199	0	70
Bread	80	48	0.49	81	0	0
Tea	-	1	-	-	20	0
Total tuna breakfast	165	56	2.09	280	20	70
Banana	200	11	1	35	503	1
Apple	125	9	0.4	13	138	1
Melon	160	11	0.8	16	160	2

Source:(2)

3. Procedure of Research

This study depended on questionnaire method, whereas will distribute about 100 – 200 questionnaire in each city of study. The questionnaire (appendix 2) will explain the type and the repetition of diets. After that we will analyze the data of questionnaire and devise the reality of nutritional behavior in Libya.

3.1 Places of study

1. Tripoli: the capital and biggest city in Libya, it is have highest population and represent the west side of Libya.

2. Benghazi: the second city in Libya and represent the east side of Libya.

3. Sabha: the biggest city in the south of Libya and represent the desert side.

Figure 3.1 Places of study

4. Results

4.1 Results of Tripoli city:

Responsive percentage to the questionnaire was 65.5 %, whereas 200 questionnaires have been distributed in 16 places of Tripoli city and collecting 131 questionnaires. From the data of collecting questionnaires we find that the number of diets is 11 diets ranging from 2.7% (Bazine) to 17.2% (Macaroni), table -12- explained types, the repetition percent and quantities of Tripoli household diets. Estimating contents of different diets from basic components: Carbohydrates, Fats, Proteins, some important minerals (Ca, Fe, P, K, Na) and Calories according to questionnaires data, nutritional value of food tables (2), which explained in tables 10- 11- and table of mean of daily intake from diets in Libya (22), appendix–5-.

Dietary daily intake of carbohydrates, fats and proteins were 212.4 – 82.3 – 81.7 g/day respectively; the total energy was 1913.7 kcal/day, table - 13 - which explain the composition of Libyan household diets in Tripoli; minerals contents in each diet was explain in appendix - 6 -; the contribution percentage of carbohydrates, fats and proteins in the total energy were 44.4 % - 38.7 % - 17.1 % respectively in Tripoli city.

Table 4.1 types, repetition percent and intake of Tripoli household diets

Diet	Repetition (%)*	Quantity (g)
Macaroni	17.2	171
Rice	15	149
Coscoci	10.8	107
Soup diet	10.7	185
Shorapa	5.7	99
Roshda	4.7	47
Fish diets	3.8	66
Bazine	2.7	27
Eggs breakfast	11.1	75
Cheese breakfast	10.5	71
Tuna breakfast	8	54
Banana	20	40
Apple	27.5	35
Melon	40	50

* the repetition percent (%)was calculating from the data of questionnaires therefore we computing the total diets number during one week of responsive and computing the number of diets separately and estimating the percent of each diet.

$$\text{Repetition \%} = \frac{\text{number of diet (macaroni)}}{\text{Total number of all diets (macaroni+ rice +……)}}$$

Table 4.2 Composition of Libyan household diets (Basic contents) in Tripoli

Diet	Gram	Water	Calories	Protein	Fat	Carbohydrate
Macaroni	171	120.9	280.4	9.2	9.4	29.6
Rice	149	78.5	293.5	6.9	12.1	49.7
Coscoci	107	62.7	258.9	7.9	8.6	13.2
Soup diet	185	128.2	240.5	6.3	22.4	25.6
Shorapa	99	69.8	146.5	8.8	6.6	12.3
Roshda	47	30.7	91.7	3.2	3.4	8.8
Fish diets	66	39.6	139.3	15.6	8.6	2.7
Bazine	27	17.6	44.8	2.1	1	6.1
Total eggs breakfast	75	49	120	5.1	3	17.3
Total cheese breakfast	71	43.6	112.7	5.6	4.2	17.4
Total tuna breakfast	54	24.7	129.6	10.3	2.6	15.4
Banana	40	15.1	22.3	0.3	0.06	6
Apple	35	23.6	20.4	0.08	0.2	5.1
Melon	50	45.9	13.1	0.3	0.1	3.2
Total	1176	750	1913.7	81.7	82.3	212.4

4.2 Results of Benghazi city:

Responsive percentage to the questionnaire was 44 %, whereas 200 questionnaires have been distributed in 14 places of Benghazi city and collecting 88 questionnaires. From the data of collecting questionnaires we find that the number of diets is 10 diets ranging from 4.8 % (shorapa) to 18.5 % (Rice), table -14- explained types, the repetition percent and quantities of Benghazi household diets. Estimating contents of different diets from basic components: Carbohydrates, Fats, Proteins, some important minerals (Ca, Fe, P, K, Na) and Calories according to questionnaires data, nutritional value of food tables (2), tables - 10- 11- and table of mean of daily intake from diets in Libya (22), appendix - 5 -.

Dietary daily intake of carbohydrates, fats and proteins were 205 – 83 – 76.8 g/day respectively; the total energy was 1865.2kcal/day, table - 15 - which explain the composition of Libyan household diets in Benghazi; minerals contents in each diet was explain in appendix - 7-; the contribution percentage of carbohydrates, fats and proteins in the total energy were 43.9 % - 40 % - 16.4 % respectively in Benghazi city.

Table 4.3 types, repetition percent and intake of Benghazi household diets

Diet	Repetition (%)	Quantity (g)
Macaroni	13	146
Rice	18.5	202
Coscoci	7	78
Soup diet	10.1	161
Shorapa	4.8	77
Roshda	6.6	74
Fish diets	7	112
Eggs breakfast	14	83
Cheese breakfast	10.8	63
Tuna breakfast	9.5	55
Banana	15	30
Apple	33	42
Melon	28	35

Table 4.4 Composition of Libyan household diets (Basic contents) in Benghazi

Diet	Gram	Water	Calories	Protein	Fat	Carbohydrate
Macaroni	146	103.2	239.4	9.9	8	20.3
Rice	202	106.5	398	9.3	16.5	60.4
Coscoci	78	45.7	188.8	7.8	6.3	9.6
Soup diet	161	111.6	209.3	5.5	19.5	20.3
Shorapa	77	53.4	100.1	4.6	9.3	10.6
Roshda	74	52.2	110	6.5	4.9	9.2
Fish diets	112	73.2	218.4	7.5	8.2	21
Total eggs breakfast	83	53.9	134.2	6.7	3.4	15.3
Total cheese breakfast	63	38.7	100	8	3.8	13.4
Total tuna breakfast	55	25.2	132	10.5	2.6	15.7
Banana	30	11.4	1.7	0.2	0.05	4.5
Apple	42	27.9	24.1	0.1	0.3	6
Melon	35	32.4	9.2	0.2	0.1	2.3
Total	1158	735.3	1865.2	76.8	83	205

4.3 Results of Sabha city:

Responsive percentage to the questionnaire was 40 %, whereas 150 questionnaires have been distributed in 13 places of Sabha city and collecting 60 questionnaires. From the data of collecting questionnaires we find that the number of diets is 11 diets ranging from 3 % (Bazine) to 19 % (Macaroni), table -16- explained types, the repetition percent and quantities of Sabha household diets. Estimating contents of different diets from basic components: Carbohydrates, Fats, Proteins, some important minerals (Ca, Fe, P, K, Na) and Calories according to questionnaires data, nutritional value of food tables (2), tables - 10- 11- and table of mean of daily intake from diets in Libya (22), appendix –5-.

Dietary daily intake of carbohydrates, fats and proteins were 209.4 – 87.1 – 88.3 g/day respectively; the total energy was 1977.2 kcal/day, table - 17 - which explain the composition of Libyan household diets in Sabha; minerals contents in each diet was explain in appendix – 8 -; the contribution percentage of carbohydrates, fats and proteins in the total energy were 42.4 % - 39.8 % - 17.8 % respectively in Sabha city.

Table 4.5 types, repetition percent and intake of Sabha household diets

Diet	Repetition (%)	Quantity (g)
Macaroni	19	207
Rice	12	130
Coscoci	8.7	95
Soup diet	14.5	227
Shorapa	4.5	71
Roshda	3.3	36
Fish diets	3.3	52
Bazine	3	32
Eggs breakfast	13	83
Cheese breakfast	11.5	74
Tuna breakfast	6.7	43
Banana	25	50
Apple	24	30
Melon	30	53

Table 4.6 Composition of Libyan household diets (Basic contents) in Sabha

Diet	Gram	Water	Calories	Protein	Fat	Carbohydrate
Macaroni	207	146.3	339.5	11.2	12.4	35.8
Rice	130	68.5	256.1	7	11.6	43.4
Coscoci	95	55.7	230	8.1	9.6	11.8
Soup diet	227	133	449.3	18.8	19.2	28.1
Shorapa	71	49.2	92.3	3.4	8.6	9.8
Roshda	36	25.4	53.3	4.2	4.4	4.5
Fish diets	52	34	101.4	37	5.8	9.7
Bazine	32	19.2	67.5	7.6	4.2	1.3
Total eggs breakfast	83	53.9	134.2	5.7	3.4	19.3
Total cheese breakfast	74	45.4	117.4	6.9	4.4	18.1
Total tuna breakfast	43	19.7	103.2	9.2	2	12.3
Banana	50	18.9	29	0.4	0.1	7.6
Apple	30	20.3	17.5	0.1	0.2	4.3
Melon	53	48.7	13.9	0.3	0.1	3.4
Total	1183	738.2	1977.2	88.3	87.1	209.4

5. Discussion

The study was depended on questionnaires method to reach its targets, whereas distributed about 550 copies of questionnaires in 43 different quarters at the three mostly populated cities in Libya (Tripoli: the capital, Benghazi: the second city and Sabha: desert city), total collecting percent was 50.7% (279 person), in other words, responsive percentage to the questionnaire was 65.5 % (131 person), 40 % (60 person) and 44 % (88 person) in Tripoli, Sabha and Benghazi respectively; there are 11 diets with repetition percent ranging from 2.7 % (Bazine in Tripoli) to 19 % (macaroni in Sabha).

Based on the amounts, repetition percentage of meals consumed by individuals on each places of study and the composition of different household diets which are explained in table - 10 - results indicate that, the content of Libyan household diets from basic components were 212.4 – 209.4 – 205 g/day carbohydrates in Tripoli, Sabha and Benghazi respectively; 82.3 – 87.1 – 83 g/day Fats in Tripoli, Sabha and Benghazi respectively and from Proteins were 81.7- 88.3 – 76.8 g/day in Tripoli, Sabha and Benghazi respectively. General means of carbohydrates, fats and protein daily dietary intakes in all study places were 208.9 – 84.1 – 82.3 g/day. Table -18-

The total energy intakes were 1913.7 – 1977.2 – 1865.2 kcal/day in Tripoli, Sabha and Benghazi respectively by general mean 1918.7 kcal Contribution percent of dietary daily intakes in total energy from carbohydrates were: 44.4 % – 42.4 % – 43.9 % by mean 43.6% ± 1, fats were: 38.7 % – 39.8 % – 40 % by mean 39.5 % ± 0.7 and proteins were: 17.1 % – 17.8 % – 16.4 % by mean 17.1 % ± 0.7 in Tripoli, Sabha and Benghazi respectively.

Comparing results of this study with recommendations of WHO/FAO indicated that, the daily intakes of energy are within/or lower the recommendation set by WHO/FAO as a total, but the contribution percent of carbohydrates are less than recommendation which say that energy balance be maintained by consuming a diet containing at least 55 percent total energy from carbohydrate from various sources; or which say An optimum diet of at least 55 percent of total energy from a variety of carbohydrate sources for all ages, except for children under two years. Or adults should consume 45 to 65 percent of their total calories from carbohydrates, 20 to 35 percent

from fat, and 10 to 35 percent from protein. Fats dietary daily intakes of this study are higher than recommendation like « Sedentary individuals should not consume more than 30 percent of their energy from fat, particularly if it is high in saturated fatty acids, which are derived primarily from animal sources »whereas the dietary intake was 39.5 which is danger and unhealthy especially for old people. And proteins daily dietary intake are within the recommendation in places of study.

There is a downside to Libyan nutritional behavior which is decrease of fresh food percentage in the diets and increase of cooked food percentage ; whereas all 11 diets in the study places are cooked meals . And the main disadvantage of all cooking is that it destroys food enzymes and some vitamins. This lead to more rapid aging and the development of degenerative diseases .(20)

Table 5.1 Daily intakes from basic nutrients in Libya

Contents	Tripoli	Sabha	Benghazi	Mean ±
Grams	1176	1183	1158	1172.3 ± 12.9
Water	750	738.2	735.3	741.2 ± 7.8
Calories	1913.7	1977.2	1865.2	1918.7 ± 56.2
Proteins	81.7	88.3	76.8	82.3 ± 5.8
Fats	82.3	87.1	83	84.1 ± 2.6
Carbohydrates	212.4	209.4	205	208.9 ± 3.7

Table 5.2 Contribution of nutrients in energy (%)

Contents	Tripoli	Sabha	Benghazi	Mean ±
Carbohydrates	44.4	42.4	43.9	43.6 ± 1
Fats	38.7	39.8	40	39.5 ± 0.7
Proteins	17.1	17.8	16.4	17.1 ± 0.7

6. Conclusions

- Fat is a high calorie food. There are 9 calories in each gram of fat. but there are 4 calories in each gram of carbohydrates and protein.
- Low-calorie diets are usually low in fat
- From a health viewpoint, not all fats are equally 'bad'. Monounsaturated fat may contain the same calories as saturated or hydrogenated fat, but it offers clear health benefits.
- Protein contains the same number of calories as carbohydrates.
- If you are trying to lose weight, it is best to follow a diet plan, which is low in fat, high in healthy carbohydrates with modest amounts of protein and 1200+ calories.
- The study did in three cities in Libya (Tripoli, Sabha and Benghazi), depending on questionnaire method.
- Responsive percentage to the questionnaire was 65.5 % (131 person) - 40 % (60 person) - 44 % (88 person) in Tripoli, Sabha and Benghazi respectively; so total number of responsive was 279 persons.
- There are 11-diet intakes by individuals in study places, with repetition percent from 2.7 % (Bazine in Tripoli) to 19 % (macaroni in Sabha),
- There are no significant differences between the types of diets in the places of study.
- The daily dietary intake of carbohydrates was 212.4, 209.4 and 205 g/day in Tripoli, Sabha and Benghazi respectively.
- The daily dietary intake of fats was 82.3, 87.1 and 83 g/day in Tripoli, Sabha and Benghazi respectively.
- The daily dietary intake of protein was 81.7, 88.3 and 76.8 g/day in Tripoli, Sabha and Benghazi respectively.
- General means of nutrients and energy daily intakes in all study places were 208.9g/day carbohydrates, 84.1 g/day fat, 82.3 g/day protein and 1918.7 kcal/day energy.

- Contribution percent of nutrients dietary daily intakes in total energy were: 43.6% carbohydrates, 39.5 % fats and 17.1 % proteins in all study places.
- The daily intakes of energy are within/or lower the recommendation set by WHO/FAO as a total, but the contribution percent of carbohydrates is less than recommendation , fats are higher than recommendation and proteins are within the recommendation in places of study .

7. Recommendations

1.Repetition like this study every limited time to knows problems in our nutritional behavior.

2.Enjoy a wide variety of nutritious foods.

3.Maintain a healthy body weight by balancing physical activity with food intake.

4.Increase carbohydrates daily dietary intake and its contribution percent in total energy intake.

5.Decrease fats daily dietary intake and its contribution percent in total energy intake.

6.All fats should be eaten sparingly. So eat a diet low in fat and, in particular, low in saturated fat.

7.The best way to obtain the right amount of carbohydrates (and calories) is to follow a balanced diet, as outlined in the Food Pyramid Guidelines. (Appendix 3)

8.Low calorie, low carbohydrate diets are not recommended

9.Do not cook what can conveniently be eaten raw

10. Try to use only a minimum of cooked food.

11. Eat your food, but especially vegetables, as soon as possible after a short cooking time.

12. Remember that the key to a healthy diet is to eat a variety of foods.

13. Protein is essential for good health, but it is better to reduce your intake of high-calorie animal protein (e.g. from cheese and meat) and eat a little more lower-fat and lower calorie vegetable protein (e.g. from beans, soybeans, lentils, nuts.)

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9. Appendixes

Appendix - 1 – recommended dietary intakes. (17)

1989 Recommended Dietary Allowances (RDA)

Life-Stage Group	Energy* (kcal)	Protein (g)	Vitamin A (μg RE)	Iron (mg)
Infants (mo)				
0-6	650	13	375	6
7-12	850	14	375	10
Children (yr)				
1-3	1300	16	400	10
4-6	1800	24	500	10
7-10	2000	28	700	10
Males (yr)				
11-14	2500	45	1000	12
15-18	3000	59	1000	12
19-24	2900	58	1000	10
25-50	2900	63	1000	10
51+	2300	63	1000	10
Females (yr)				
11-14	2200	46	800	15
15-18	2200	44	800	15
19-24	2200	46	800	15
25-50	2200	50	800	15
51+	1900	50	800	10
Pregnancy	+300	60	800	30
Lactation				
1st 6 mo	+500	65	1300	15
2nd 6 mo	+500	62	1200	15

2000 Dietary Reference Intakes (DRI)

Life-Stage Group	Calcium† (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin‡ (mg)	Vitamin C (mg)
Infants (mo)					
0-6	210	0.2†	0.3†	2†	40†
7-12	270	0.3†	0.4†	4†	50†
Children (yr)					
1-3	500	0.5	0.5	6	15
4-8	800	0.6	0.6	8	25
Males (yr)					
9-13	1300	0.9	0.9	12	45
14-18	1300	1.2	1.3	16	75
19-30	1000	1.2	1.3	16	90
31-50	1000	1.2	1.3	16	90
51-70	1200	1.2	1.3	16	90
>70	1200	1.2	1.3	16	90
Females (yr)					
9-13	1300	0.9	0.9	12	45
14-18	1300	1.0	1.0	14	65
19-30	1000	1.1	1.1	14	75
31-50	1000	1.1	1.1	14	75
51-70	1200	1.1	1.1	14	75
>70	1200	1.1	1.1	14	75
Pregnancy					
≤18 yr	1300	1.4	1.4	18	80
19-50 yr	1000	1.4	1.4	18	85
Lactation					
≤18 yr	1300	1.4	1.6	17	115
19-50 yr	1000	1.4	1.6	17	120

* Energy needs shown are based on average size and light-to-moderate activity levels. Individual needs may vary because of sedentary or more physically active lifestyle and/or smaller or larger body size.

† Values represent Adequate Intake.

‡ Expressed as niacin equivalents. 1 mg niacin = 60 mg tryptophan; 0-6 months = preformed niacin, not niacin equivalents.

Note: RDAs and DRIs should not be confused with reference values for food labels established by the U.S. Food and Drug Administration, as follows: vitamin A = 5,000 IU; iron = 18 mg; calcium = 1,000 mg; thiamin = 1.5 mg; riboflavin = 1.7 mg; niacin = 20 mg; vitamin C = 60 mg.

Sources: Adapted, with permission, from Subcommittee on the Tenth Edition of the RDAs (1989) and Standing Committee on the Scientific Evaluation of Dietary Reference Intakes (1997, 1998, 2000).

Appendix - 2 - Nutritional questionnaire model

Nutritional questionnaire

Instructions:

This questionnaire has been included in study of nutritional behavior in Libya, so go after the following instructions:

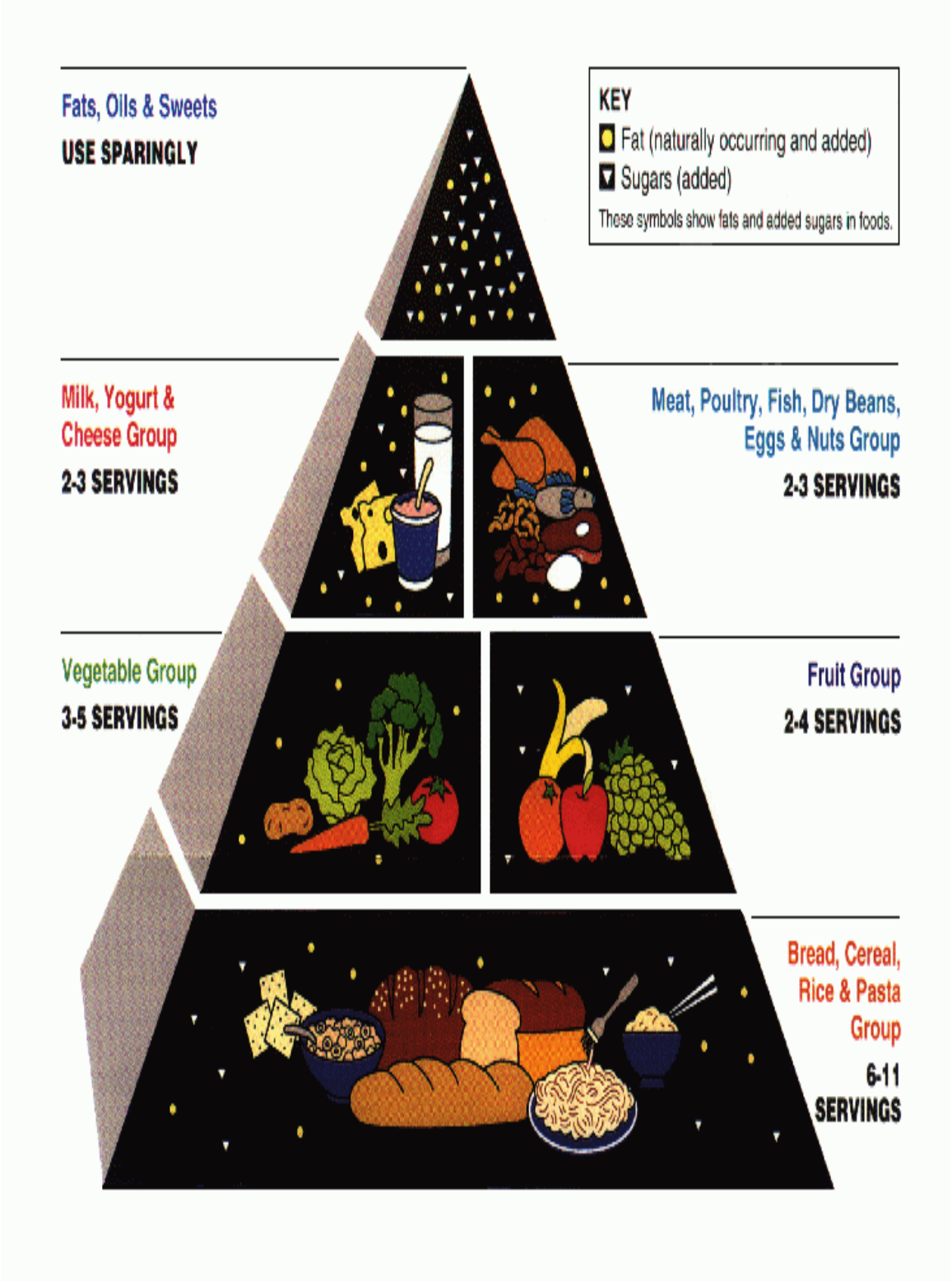
1. The questionnaire prepared for one week.
2. Every day contains three columns (breakfast – lunch – diner).
3. Try to explain the content of meals (breakfast: bread, milk, cheese) – (lunch: pasta, salad, juice, fries) – (diner: bread soup, salad ...).
4. Try to estimate quantities of eaten meals (one kg of pasta for family – half of kg – big loaf of bread or small – cup of milk
5. Explain types of foodstuffs, which used in meals.
6. Explain types of fruits.

Questionnaire model

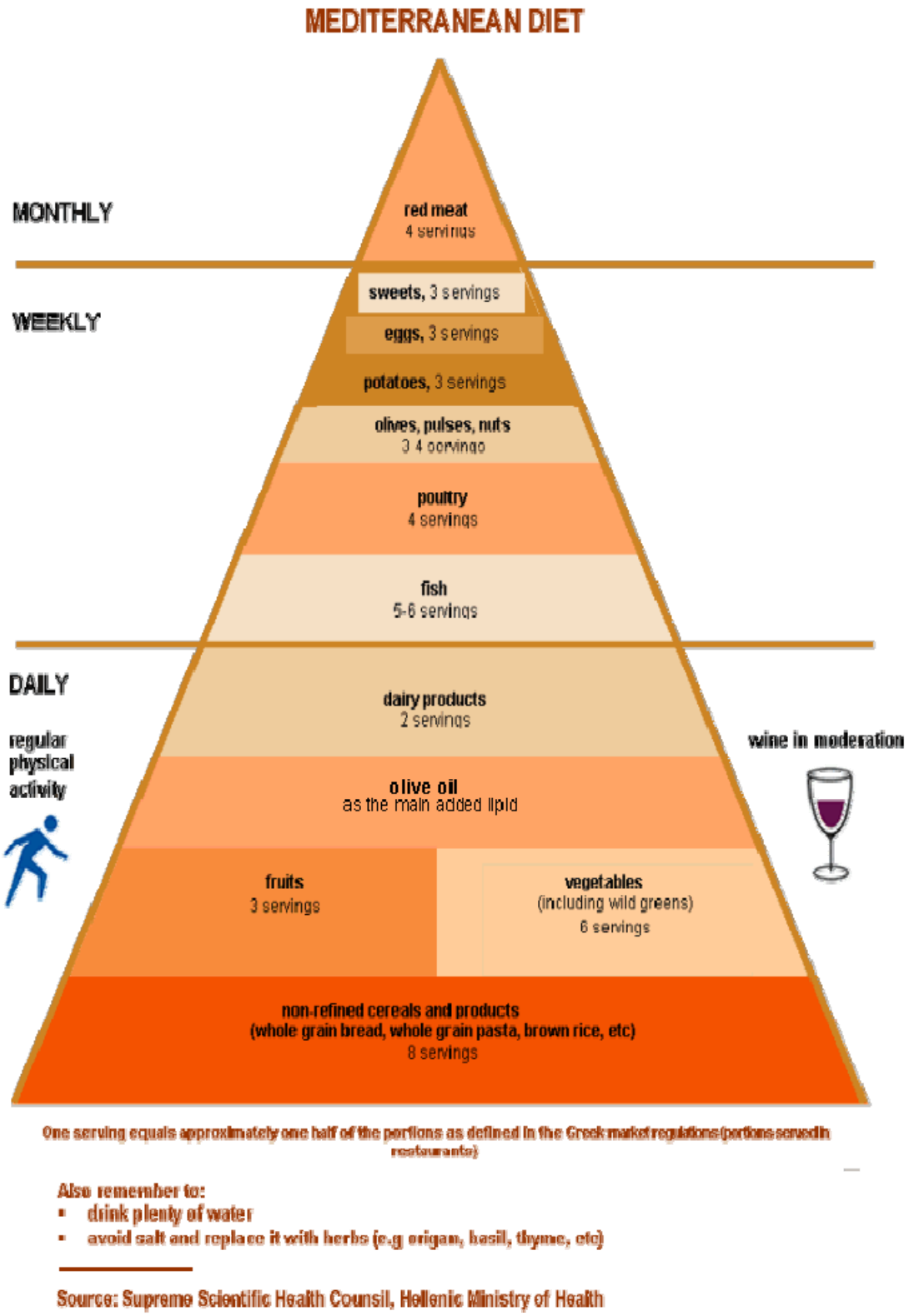
City..... Name.....No. of family.....

day	breakfast	Lunch	diner
Saturday			
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

Appendix - 3 - Food Guide Pyramid (7).



Appendix - 4 – Mediterranean diet pyramid (25)



Appendix - 5 - Mean of daily intake from diets. (22)

No	Diets	Quantity
1	Breakfast	
	Eggs breakfast	200
	Cheese breakfast	170
	Tuna breakfast	170
2	Lunch	
	Macaroni – rice – coscoci - roshda- bazine	500
3	Dinner	
	Soup – shorapa – fish diets	350

Appendix – 6 - Composition of Libyan household diets (minerals) in Tripoli

Diet	gram	Ca	Fe	P	K	Na
Macaroni	171	12.7	60.9	2.9	473.7	449.7
Rice	149	40.5	31.4	1.9	314.4	111.8
Coscoci	107	8	30.5	1.2	250.4	212.9
Soup diet	185	18.5	45.7	3.5	710.4	647.5
Shorapa	99	20.5	22.1	1.4	341.6	125.7
Roshda	47	6.9	156.5	0.6	-	-
Fish diets	66	27.5	15.3	0.8	181.5	109.6
Bazine	27	7	5.3	0.3	52.4	24.6
Total eggs breakfast	75	95.9	0.5	0.5	18.4	27.7
Total cheese breakfast	71	85.2	0.2	88.9	18.4	27.7
Total tuna breakfast	54	18.3	0.7	91.6	6.5	22.9
Banana	40	2.2	0.2	7	101	0.2
Apple	35	2.5	0.1	3.6	38.6	0.3
Melon	50	3.4	0.3	5	50	0.4
Total	1176	349.1	369.7	209.2	2557	1761

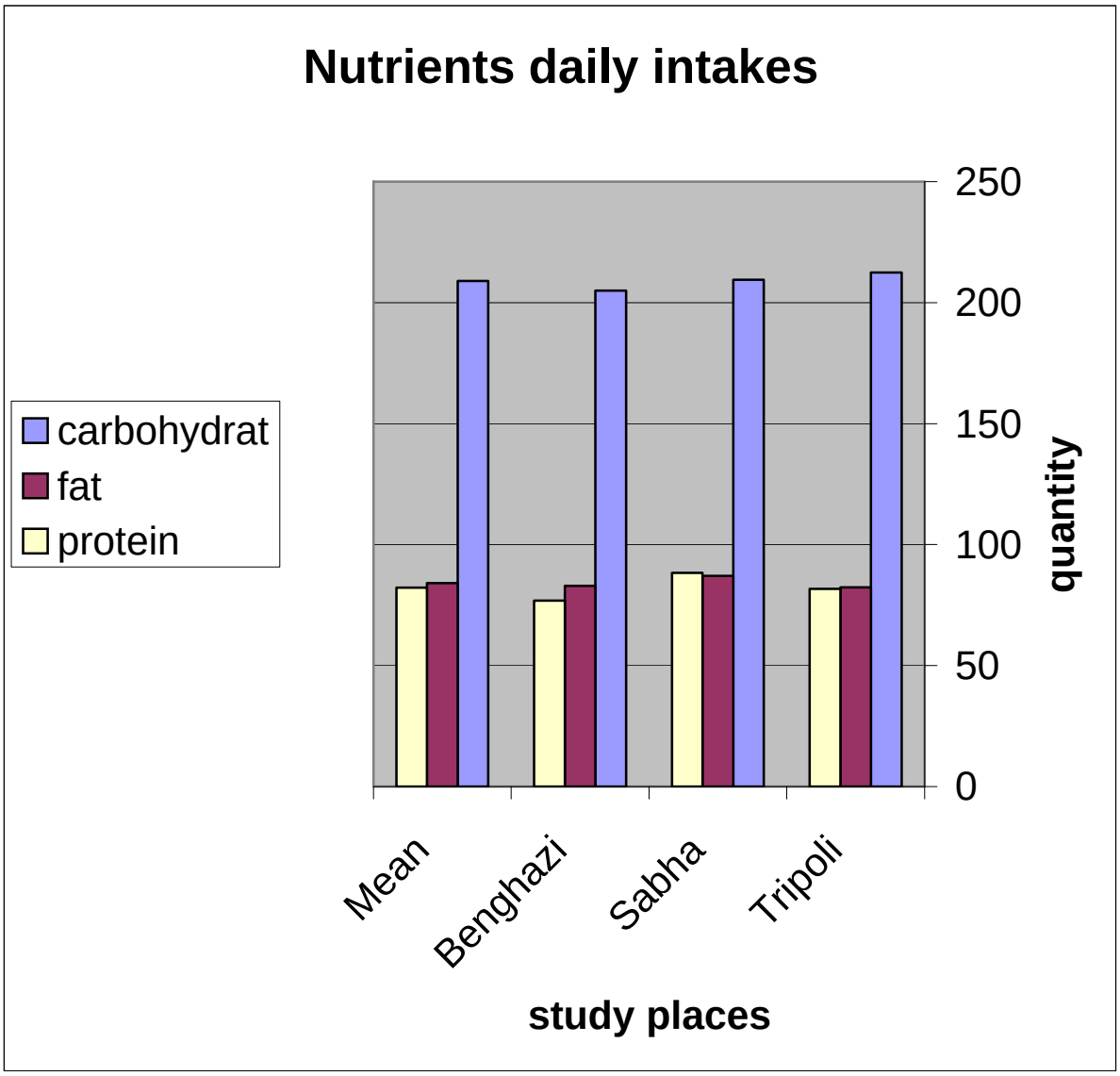
Appendix – 7 - Composition of Libyan household diets (minerals) in Benghazi

Diet	Gram	Ca	Fe	P	K	Na
Macaroni	146	10.8	52	2.5	404.4	384
Rice	202	54.8	42.6	2.6	426.2	151
Coscoci	78	5.9	22.2	0.9	1825	155.2
Soup diet	161	16.1	39.8	3	618.2	563.5
Shorapa	77	15.9	17.1	1.1	256.7	97.8
Roshda	74	10.9	246.4	1	-	-
Fish diets	112	46.7	25.9	1.3	308	185.9
Total eggs breakfast	83	106.1	0.5	0.5	20.6	50.2
Total cheese breakfast	63	75.6	0.2	78.9	16.3	24.6
Total tuna breakfast	55	18.7	0.7	93.3	6.7	23.3
Banana	30	1.7	0.2	5.3	75.5	0.2
Apple	42	3	0.1	4.4	46.4	0.3
melon	35	2.4	0.2	3.5	35	0.4
Total	1158	368.6	447.9	198.3	4039	1636.4

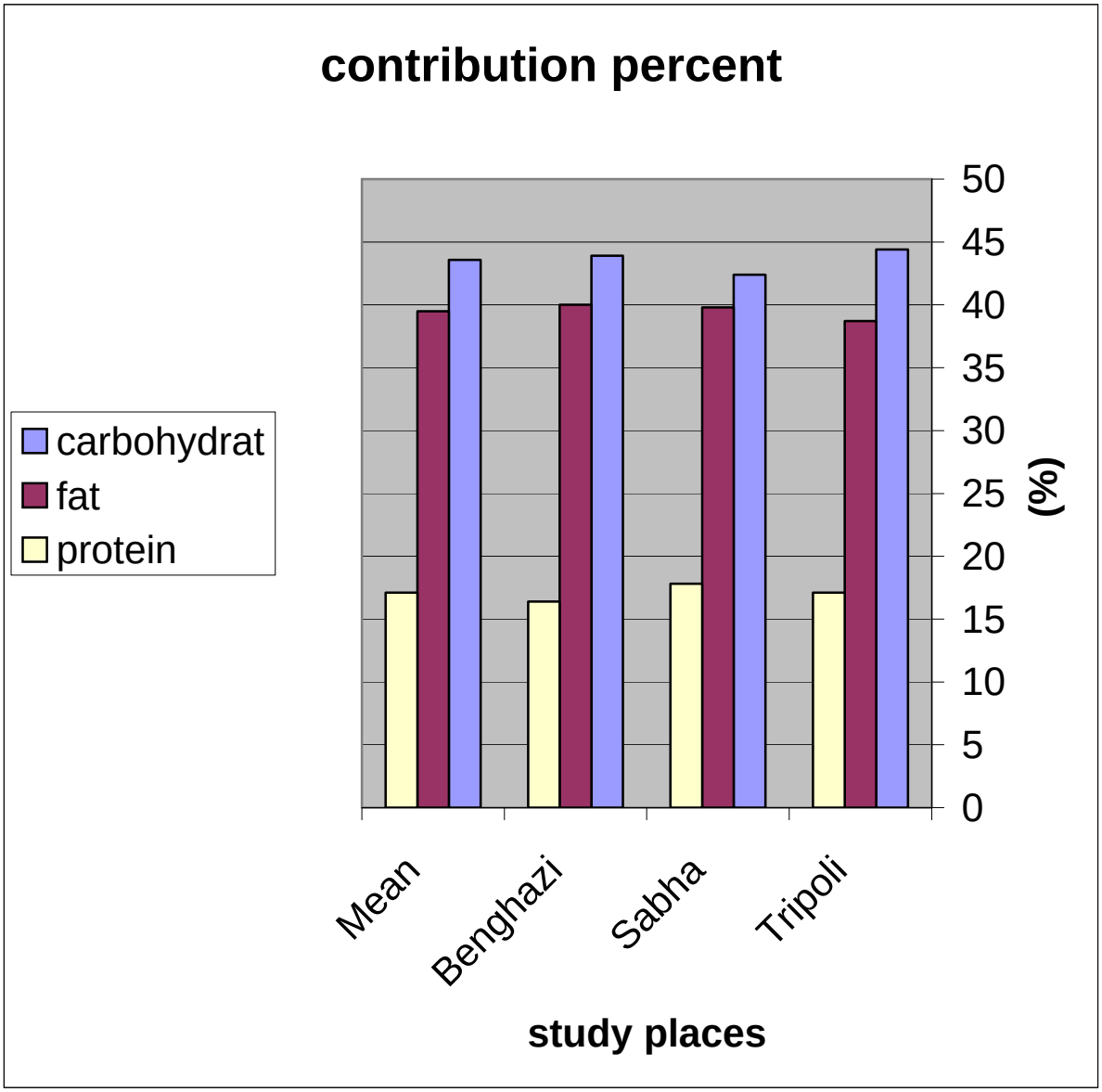
Appendix - 8- Composition of Libyan household diets (minerals) in Sabha

Diet	Gram	Ca	Fe	P	K	Na
Macaroni	207	15.3	73.7	3.5	573.4	544.4
Rice	130	35.3	27.4	1.7	274.3	97.5
Coscoci	95	7.1	27.1	1.1	222.3	189.1
Soup diet	227	22.7	56.1	4.2	871.7	794.5
Shorapa	71	14.7	15.8	1	245	90.2
Roshda	36	5.3	119.9	0.5	-	-
Fish diets	52	21.7	12	0.6	143	86.3
Bazine	32	8.4	6.2	0.4	62	29.1
Total eggs breakfast	83	106	0.5	0.5	20.6	50.2
Total breakfast	74	88.8	0.2	92.7	19.2	28.3
Total tuna breakfast	43	14.6	0.5	73	5.2	18.2
Banana	50	2.8	0.3	8.8	125.8	0.3
Apple	30	2.2	0.1	3.1	33	0.2
Melon	53	3.6	0.3	5.3	45.5	0.7
Total	1183	348.5	340.1	196.4	2641	1929

Appendix – 9 – nutrients daily intake



Appendix – 10 – contribution percent



Appendix – 11 – food balance sheet