INTRODUCTION

The life stage of childhood and adolescence is important for the establishment of eating behaviors *(Rogol et al., 2002).* Therefore, diet in the early stage of life influences health not only during the physical development, but also later in life *(Tercyak and Tyc, 2006).* Many university students are considered late adolescents, the age of whom spans from 15 to 19yrs *(WHO, 2006).*

Eating habits is a major public health concern among young adults who experienced transition into university life *(Nelson et al., 2009a).* Students are exposed to various factors, e.g. stress and lack of time *(Rubina et al., 2009).* These factors may lead to poor eating habits and substance abuse *(Nelson et al., 2009b).*

It is now well established that poor eating habits and limited physical activity are directly linked to serious health consequences later in life such as osteoporosis, obesity, hyperlipedemia, and diabetes *(Bazzano, 2006; Hallal et al., 2006; Maximova, 2008).*

Rapid changes in physical growth and psychosocial development have placed young adults as

nutritionally vulnerable groups with poor eating habits that fail to meet dietary requirements *(Chin and Mohd, 2009).* Some common unhealthy eating patterns among young adults include meal skipping, eating away from home, snacking and fast food consumption *(Savige et al., 2007).*

Furthermore, adolescence is characterized by higher consumption of low-quality foods, lower consumption of high-quality foods, decreased milk and fruit consumption in addition to increased carbonated and/or sweetened beverage consumption *(Spencer, 2002).*

Environmental factors also contribute to unhealthy eating habits among university students *(Dowda et al., 2001).* The restaurants and fast food outlets have created an alarming situation for young adults to practice unhealthy eating habits *(Jeffery et al., 2006).*

University students lack knowledge of healthy food choices that may affect eating habits and nutritional status negatively *(Gan et al., 2011).* University students commonly fail to meet the recommended intakes of fruits and vegetables *(Moy et al., 2009; Ganasegeran et al., 2012).*

University students had frequent snacking habits *(Yahia et al., 2008)* and a higher frequency of fast food consumption *(Alizadeh and Ghabili, 2008).*

Obesity in combination with unhealthy lifestyle, such as smoking and physical inactivity, may increase the risk of chronic diseases. In this regard, nutritional knowledge may act as a deterrent against fast-food trend. Thus, universities may contribute significantly in reducing the prevalence of obesity among the young population through the promotion of healthy eating habits. Universities may provide an ideal forum for nutrition education programs that may positively influence students' eating habits by advocating for healthy food choices *(Yahia et al., 2008).*

The high prevalence of obesity and nutrition related diseases highlights the need to focus on nutritional interventions early in life. Knowledge about actual nutritional intake and diet behavior among children and adolescents is essential *(WHO, 2004).*

Significance of the Study

Changing life styles in Egypt, with more high density food, more stress, and less physical activity, are leading to diet-related diseases that are becoming

more prevalent among younger age groups *(Hassan et al., 2004).*

Based on national surveys, the nutrition status in Egypt indicates a double burden: under-nutrition as well as chronic diseases, such as hypertension (26%) and diabetes mellitus (9.3%) *(Eid, 2004).* Prevalence of Overweight and obesity were found to be 11.3% and 9.1%, respectively, in Egyptian adolescents *(Hassan et al., 2010)*. In addition, low levels of serum calcium (>20%), zinc (8.5%), iodine (9%) and also iron deficiency anemia (Hemoglobin <12g/dL) was found in 23% of Egyptian adolescents *(Yahia et al., 2008).*

AIM OF THE WORK

The aim of this study was to determine the dietary health patterns among university students through:

1. Assessing the knowledge regarding dietary patterns and relation to health condition.
2. Assessing the common dietary patterns among university students.
3. Identifying university students' dietary healthy behaviors.
4. Finding out the factors affecting university student's dietary patterns and healthy behaviors.

Research questions:

1. Do students have adequate knowledge about healthy dietary pattern and behaviors?
2. What is the common dietary intake of university students?
3. Is there a relation between identified factors affecting the dietary patterns and behaviors?
4. Are student's dietary behaviors healthy or not?

REVIEW OF LITERATURE

I. Nutrition

Nutrition is the sum of all processes involved in the intake, assimilation, and utilization of the proper amounts of nutrients to maintain health, well-being, and productivity. Good nutrition relies on a diverse, adequate diet and is essential for the development and maintenance of the body from infancy to old age. Thus "nutrition" is a process of events, while "food" is a product that is eaten or taken into the body. Food contains nutrients that the body needs *(ECSA-HC, 2008)*.

Nutrients are the substances in food that the body uses to function properly. The essential nutrient groups include the following key nutrients: Carbohydrates, Proteins, Fats, Vitamins, Minerals and Water. Nutrients are divided into macronutrients and micronutrients. Macronutrients are nutrients needed by the body in relatively large quantities (many grams per day and include carbohydrates, fats, and proteins). Micronutrients are nutrients needed by the body in very small quantities (usually less than 1gm/day) and include vitamins and minerals *(ECSA-HC, 2008)*.

The body's response to nutrients and the subsequent outcome is called 'nutritional status'. The

amount and type of food and drink a person eats is called the diet. A 'nutritious' or 'balanced' diet includes a variety of foods and the proper nutrients in the correct amounts and combinations to meet the body's functional needs. A healthy and balanced diet should contain food free of harmful substances and in the optimal amounts and mixtures *(Madise and Mpoma, 1997).*

Dietary reference Intakes (DRIs)

The concept of balanced diet for different categories of people is a good approach to have healthful diet. Unfortunately an ideal diet cannot be defined. It will not be practical to advocate a very specific diet or to recommend a very general diet. This has lead to the concept of recommended dietary allowances (RDA). The individuals of similar age, sex and physical activity levels may have different nutrient needs. Recommended dietary allowance (RDA) are the levels of intake of essential nutrients considered to be adequate to meet the known nutritional needs of healthy persons *(TNAU Agritech Portal, 2013).*

Until 1997, the RDAs were the only standard present until the Dietary Reference Intakes recommendations were available. The Dietary Reference Intakes (DRIs) are sets of nutrient

standards developed jointly by the United States Institute of Medicine (IOM) and Health Canada to assess nutrient intakes and plan diets for individuals and groups. The DRIs are meant to express the least amounts of nutrients in order to reduce risk of nutritional disorder *(Brooks et al., 2004).*

Table (1) shows requirements of different nutrients for males and females in three age groups *(Institute of Medicine, 1997, 1998, 2000, 2001 and 2002).*

Table (1): Dietary Reference Intakes (DRIs): Estimated Average Requirements

Item	Males			Females		
	9-13y	*14-18y*	*19-30y*	*9-13y*	*14-18y*	*19-30y*
Calcium (mg/d)	1,100	1,100	800	1,100	1,100	800
CHO (g/d)	100	100	100	100	100	100
Protein (g/kg/d)	0.76	0.73	0.66	0.76	0.71	0.66
Vit A (µg/d)a	445	630	625	420	485	500
Vit C (mg/d)	39	63	75	39	56	60
Vit D (µg/d)	10	10	10	10	10	10
Vit E (mg/d)b	9	12	12	9	12	12
Thiamin (mg/d)	0.7	1	1	0.7	0.9	0.9
Ribo-flavin (mg/d)	0.8	1.1	1.1	0.8	0.9	0.9
Niacin (mg/d)c	9	12	12	9	11	11
Vit B6 (mg/d)	0.8	1.1	1.1	0.8	1	1.1
Folate (µg/d)d	250	330	320	250	330	320
Vit B12 (µg/d)	1.5	2	2	1.5	2	2
Iodine (µg/d)	73	95	95	73	95	95
Iron (mg/d)	5.9	7.7	6	5.7	7.9	8.1
Magnesium (mg/d)	200	340	330	200	300	255
Phosphorus (mg/d)	1,055	1,055	580	1,055	1,055	580
Zinc (mg/d)	7	8.5	9.4	7	7.3	6.8

Institute of Medicine (1997, 1998, 2000, 2001 and 2002): Dietary Reference Intakes.

Food Guide Pyramid

Food based dietary guidelines (FBDG) are used to assist in making proper healthy dietary choices, development of education programs, primary disease prevention and promoting the production of healthy food. The guidelines should be available, easily understood, acceptable and compatible with national food habits *(Sirichakwal, 2004).*

Food guides are needed to help the application of the dietary guidelines in the daily eating patterns and life habits of individuals. Food guides are graphic presentations in the form of a pyramid, a dome or other shapes. They are designed to help people recall the needed foods and their recommended proportions or quantities *(Muehlhoff, 2004).*

Therefore, the USDA issued a Food Guide Pyramid to help people apply the Dietary Guidelines to their own diets. The Food Guide Pyramid derived from an eleven year process of research and testing *(USDA, 1995).*

The pyramid was intended to display a dietary pattern that would meet two goals at once: provide a balance and quantity of nutrients sufficient to provide RDAs (Recommended Daily Allowances), but also to meet targets for reduced intake of fat, saturated fat,

cholesterol, salt and sugar. Furthermore, the pyramid was to convey three key concepts: variety, moderation and proportionality. *Variety* meaning the number of foods; *moderation* as the need to eat less of foods high in fat and sugar; and *proportionality* meaning that more should be consumed from some food groups than others ***(Welsh et al., 1992)***. The pyramid shows a hierarchical dietary pattern in which most daily food servings are derived from the grain, vegetable, and fruit groups, and even fewer from the foods high in sugar and fat ***(Nestle, 1998).***

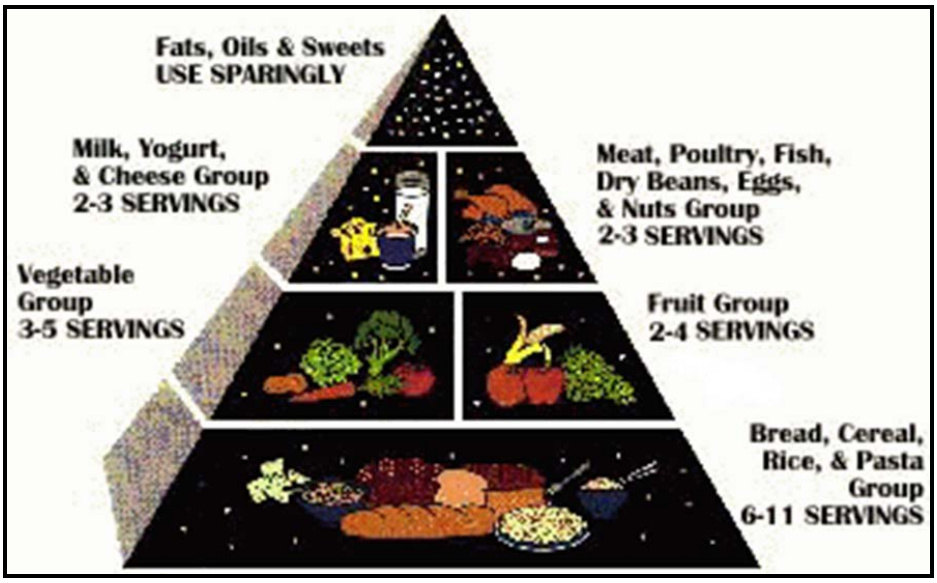

Fig. (1): Food guide pyramid.

USDA (1995): U.S. Dep. of Agriculture, Agricultural Research Service, Dietary Guidelines Advisory Committee. Report of the dietary guidelines advisory committee on the dietary guidelines for Americans, 1995.

Updated Food Guide Pyramid (MyPyramid)

Since the release of the original Pyramid in 1992, new standards for nutrient intakes, the Dietary Reference Intakes (DRIs), were established by the National Academy of Sciences, Institute of Medicine. In addition, new data became available on food consumption and food composition data. The revision to the food guidance system was necessary *(USDA, 2005).*

Thus, the updated Food Guide Pyramid (My Pyramid) was released in April 2005. It was based on the 2005 Dietary Guidelines issued by USDA and HHS in January 2005, in addition to the Dietary Reference Intakes and the Dietary Guidelines Advisory Committee Report *(USDA, 2005).*

The updated Food Guide Pyramid (MyPyramid) retains all the food groups from the original Pyramid, but it also includes a graphic representation of physical activity-an important additional recommendation for a healthy way of life.

The reason to revise the food guidance system was to help people more effectively put the guidance into action. The new food guidance system is made up of motivational and educational tools. The motivational tools are the new graphic and the slogan. The

educational tools include the education framework, consumer messages, print materials, a website with detailed nutrition information, as well as interactive tools to help individuals personalize their diets *(USDA, 2005).*

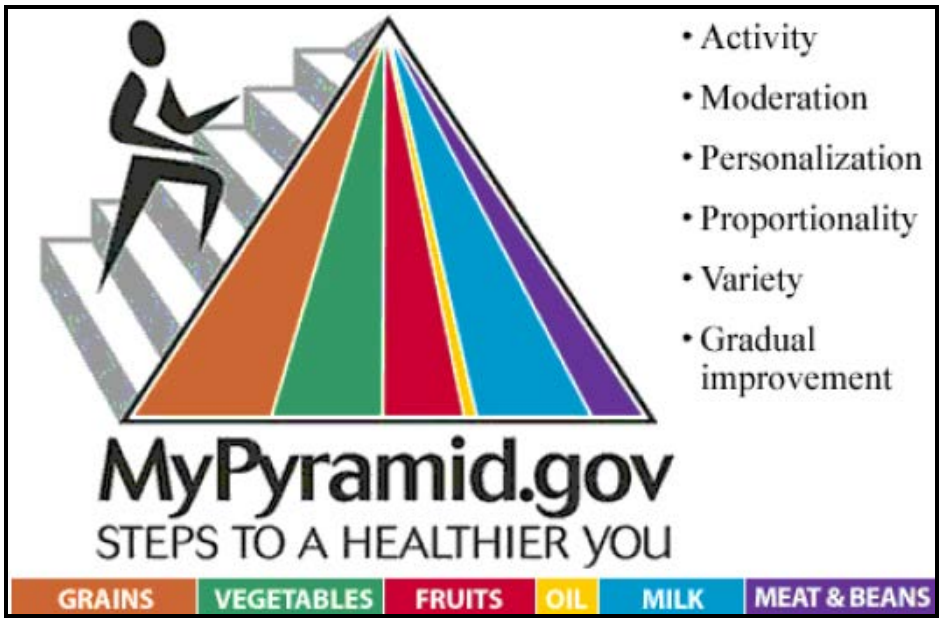

Fig. (2): The updated Food Guide Pyramid (MyPyramid).

USDA (2005): U.S. Department of Agriculture. Available online: http://www.mypyramid.gov/

Main food groups (USDA, 2005; Egyptian Hypertension Society, 2006):

Foods sharing similar nutritional properties are grouped together. Understanding the basic food groups can help planning a healthy daily diet. The following list summarizes the main food intake groups:

- **Fruit Group** includes all fresh, frozen, canned, and dried fruits and fruit juices. In general, 1 cup of fruit or 100% fruit juice, or 1/2 cup of dried fruit can be considered as 1 cup from the fruit group.
- **Vegetable Group** includes all fresh, frozen, canned, and dried vegetables and vegetable juices. In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.
- **Grains Group** (whole and refined) includes all foods made from wheat, rice, oats, and barley, such as bread, pasta, oatmeal and breakfast cereals. In general, 1 slice of bread, 1 cup of ready-to-eat cereal, or 1/2 cup of cooked rice, pasta, can be considered as 1 ounce equivalent from this group. Most cereals are highly processed before they are consumed. Refined grain products (such as white flour) contain more starch but lower amounts of dietary fiber. At least half of all grains consumed should be whole grains.
- **Meat and Beans Group** in general, 1 ounce of lean meat, poultry, or fish, 1 egg, 1 tablespoon peanut butter, 1/4 cup cooked dry beans, or 1/2 ounce of nuts or seeds can be considered as 1 ounce equivalent from the meat and beans group.

- **Milk Group** includes all fluid milk products and foods made from milk that retain their calcium content, such as yogurt and cheese. Foods made from milk that have little to no calcium, such as cream cheese, cream, and butter, are not part of the group. Most milk group choices should be fat-free or low-fat. In general, 1 cup of milk or yogurt, 1 1/2 ounces of natural cheese, or 2 ounces of processed cheese can be considered as 1 cup from the milk group.
- **Oils and fats** include fats from many different plants and from fish that are liquid at room temperature, such as canola, corn, olive, soybean, and sunflower oil. Some foods are naturally high in oils, like nuts, olives, some fish, and avocados. Foods that are mainly oil include certain salad dressings, and soft margarine.

Healthful diet and recommended dietary behavior:

Food-based dietary guidelines: With support from the United Nations Children's Fund (UNICEF), National Nutrition Institute of Egypt (NNI) produced food-based dietary guidelines for Egypt in 1995. These guidelines were directed at educated people, nutrition educators in the health sectors, NGOs and others. They included simple practical messages for healthy eating and lifestyles *(Tawfik, 2011).*

The concept of food-based dietary guidelines (FBDG) has been promoted by several international organizations. However, there are no FBDG for the countries in the Arabian region. As the Arab Gulf countries share similar a socioeconomic and nutrition situation, an attempt was made to develop FBDG for these countries *(Musaiger et al., 2012).*

The shape of the dome was chosen as a picture illustration for the Dietary Guidelines for Arab Countries. This Food Dome provides dietary guidelines for the Arab people to prevent the risk of diet-related diseases. It is also a useful tool for nutrition education *(Arab Center for Nutrition, 2011).*

Table (2) shows the basic food groups and the suggested daily servings according to Arab Guidelines:

Table (2): Food groups and suggested daily servings

Food Group	Servings	Serving sizes
Cereals and their products	6-11	1 slice, 1/4 Arabic flat bread, 30 g cornflakes, 1/2 cup cooked cereals (rice, wheat oat, macaroni), 6 small crackers (use whole meal cereals).
Vegetables	3-5	1 cup raw leafy vegetables or cooked vegetables, 3/4 cup vegetable juice.
Fruit	2-4	1 medium piece of fruit (banana, apple, mango, pear), 1/2 cup fresh, frozen or canned fruit, 3/4 cup fruit juice.
Milk and dairy products	2-3	1 cup of milk, laban or yoghurt, 43 g of cheese, 1 tablespoon cream cheese (use low fat dairy product).
Meat, chicken, fish, eggs, legumes and nuts	2-4	50-80 g of meat, chicken or fish, one egg, 2 tablespoons of peanut butter, 1/2 cup legumes, 1/3 cup nuts, 2 tablespoons of seeds.

Arab Center for Nutrition (2011): Food Dome: Dietary Guidelines for Arab Countries. Bahrain, http://www.acnut.com/.