INTRODUCTION

The prevalence and severity of obesity in children and adolescent is dramatically increasing worldwide. For example between 1980 and 2000, the prevalence of childhood overweight doubled among children 6-11 years and tripled among children 12-17 years in the United States ***(Whitelock et al., 2005).***

Increased urinary albumin excretion (microalbuminuria) is a marker of endothelial dysfunction and reflects renal and systemic endovascular damage ***(Ritz et al., 2003 and Stehouwer et al., 1992).***

Microalbuminuria, which was originally used to predict the development of overt diabetic nephropathy in patients with diabetes mellitus ***(Araki et al., 2008),*** is now also considered to be an early marker of renal damage in nondiabetic subjects ***(Verhave et al., 2008).***

While the mechanism that links MA and CV disease remains unclear, prevailing evidence suggests that glomerular leaking of albumin is a reflection of general vascular damage, therefore denoting preclinical atherosclerosis ***(Pedrinelli et al., 2001).***

Indeed, MA is considered a sign of endothelial dysfunction. In light of these reports, it has been suggested that

MA screening should be added to the measurement of blood pressure and lipids in the assessment of the CV risk prolife in adults ***(Feldt- Rasmumen et al., 2000).***

Whether obesity in youth similarly impacts the presence of MA and whether it causes variations in traditional and non-traditional CV risk factors remains to be determined ***(van Vliet et al., 2010).***

This study will be undertaken to examine these questions in a sample of obese children and adolescents without type 2 diabetes mellitus.

AIM OF THE WORK

To assess the prevalence of microalbuminuria (MA) among a group of obese children and adolescents, and to evaluate the relation of microalbuminuria (MA) with other cardiovascular risk factors.

OBESITY

Overweight and obesity in childhood and adolescence are increasingly prevalent in westernised countries, in countries undergoing economic transition and is related to certain lifestyle changes. Itd is becoming the target public health problem, not just in the United States but world wide ***(Lustig, 2001).***

Twenty-seven percent of the American population is obese (body mass index [BMI] >/= 30 kg/m^2), resulting in approximately 300,000 deaths annually and $100 billion per year in direct and indirect costs ***(Klein et al., 2002).***

Obese individuals are at increased risk for hypertension, diabetes, pulmonary disease, hyperlipidemia, cardiomyopathy, malignancy, arthritis, infertility, sleep apnea, and psychosocial impairments. Given the fact that intentional weight loss improves many of these comorbidities ***(Pi-Sunyer, 1996).***

The awareness of childhood obesity as a major health problem and an uncontrolled worldwide epidemic has to be increased in the society. In order to improve the quality of the health care and to minimize the cost it is important to investigate and standardize pediatric obesity prevention and treatment and to adapt to social and cultural aspects ***(Wang, 2004).***

Many different approaches of treatments of obesity have been investigated, including diet, exercise, behavioral therapy,

surgery, and medication. None have been found to be effective enough as sole tools in children. This has led to focus on multidisciplinary programs especially involving families. Behavioral cognitive therapy is effective in treating childhood obesity as is family therapy. It is important to know and to follow nutritional factors, energy intake and composition of the diet, nutrition and hormonal status, food preferences and behavior, and the influence of non-nutritional factors ***(Flodmark et al., 2004).***

For successful obesity management, the child should be assessed and treated by a multidisciplinary team, including a physician, dietitian, exercise expert, nurse and behavioral therapist ***(Nowicka, 2005).***

Obesity is not equivalent to overweight, Obesity denotes excess body fat, whereas overweight might relate to fat or other tissue in excess with relation to health ***(Yamborisut and Mo-Suwan, 2014).***

While several accepted classifications and definitions exist for degrees of obesity, the most widely accepted is the World Health Organization (WHO) criteria based on BMI. Under this convention for adults, ***grade 1*** overweight (commonly and simply called **overweight**) is a BMI of 25-29.9 kg/m^2. ***Grade 2*** overweight (commonly called **obesity**) is a BMI of 30-39.9 kg/m^2. ***Grade 3*** overweight (commonly called severe

or **morbid obesity**) is a BMI greater than or equal to 40 kg/m^2 ***(Niehues et al., 2014).***

The surgical literature often uses a different classification in order to recognize particularly severe obesity. In this setting, a BMI greater than 40 kg/m^2 is described as *severe obesity*, a BMI of 40-50 kg/m^2 is termed *morbid obesity*, and a BMI greater than 50 kg/m^2 is termed *super obese* ***(Nowicka, 2005).***

Definition:

Obesity is defined as an excessive accumulation of body fat. Obesity is present when total body weight is more than 25 percent fat in boys and more than 32 percent fat in girls. Not all obese infants become obese children, and not all obese children become obese adults. However, the prevalence of obesity increases with age among both males and females ***(Bibiloni Mdel et al., 2013).***

There is a greater likelihood that obesity beginning in early childhood will persist through the life span ***(Arsenault et al., 2014).***

There are many methods used to define obesity and overweight:

1- **Weight percentile:** is useless as this term does not take in consideration the height of the child which modifies the appropriateness of weight.

2- **Height-weight method:** is an important but does not differentiate between increased muscles compared with increased adipose tissue.

3- **Body mass index (BMI): BMI-for-age/sex**

The definition of BMI is weight in kilograms divided by height in meters squared.

BMI = weight (kg) /height $(m)^2$ ***(Nowicka, 2005).***

The advantages of using BMI-for-age are (1) it can be used continuously from age 2 years through adulthood. (2) allow significant changes in growth patterns to be recognized and addressed before children become severely overweight. It also facilitates anticipatory guidance for children and adolescents at risk of overweight or for those who are underweight ***(Nowicka, 2005).*** However, the controversies of using BMI-for-age are **(**1) BMI is used differently to define overweight in children and adolescents than it is in adults. (2) BMI changes substantially as children get older, and girls and boys differ in body adiposity as they mature. Thus, for this group, BMI is age and gender specific. BMI is plotted on a chart of the appropriate sex, relative to the child's age ***(Niinikoski et al., 2009).***

Thus, the increasing prevalence, numerous health risks, and economic cost of obesity clearly justify wide spread efforts towards prevention efforts should begin in childhood because

the behaviors are learned and continue throughout the life time ***(Goran and Treut, 2001).***

Epidemiology and Prevalence of overweight among children and adolescents

Prevalence of overweight among children nearly doubled from 1976-1980 to 1999-2002 in the United States**.** During 1999-2002, approximately 65% of adults aged ≥20 years were overweight or obese, according to the National Health and Nutrition Examination Survey (NHANES**).** Among persons aged 6-19 years during the same period, 31% were overweight or at risk for overweight ***(Hedley et al., 2004).***

In 2003, the Youth Risk Behavior Surveillance (YRBS) survey indicated that 27% of high school students were overweight or at risk for overweight ***(Grunbaum et al., 2003).*** Among adolescents with a body mass index (BMI) at or above the 95th percentile, approximately 50% will become obese adults, ***(Dietz, 1998),*** and 70% will become obese or overweight adults ***(Rockville, 2001).***

The American Academy of Pediatrics (AAP**) *(Krebs et al., 2003)*** recommend annual assessments of BMI as a strategy for preventing and combating childhood obesity ***(Centers for Disease Control and Prevention (CDC), 2006).***

Obesity is the most widespread and severe nutritional problem of children in the United states, with prevalence rates

that vary greatly by ethnic groups ***(Rosner et al., 1998).*** Rates are generally highest for Hispanic and Native American children of both sexes and for African –American girls ***(Ogden et al., 1994).***

Childhood obesity is also a concern among pacific Islanders and an increasing problem among Asians ***(Wadden et al., 1990).***

Data availability

Prevalence rates of obesity for children aged 6-11 years and adolescents aged 12-17 years are available from the national health examination survey (NHES; 1963-1965, 1996-1970), the National Health and Nutrition Examination Survey (NHANES – I; 1971-1974) NHANES-II (1976-1980), NHANES –III (1988-1994), and Hispanic NHANES (1982-1984). Trial for cardiovascular health provide additional information on prevalence rates of Over-weight and obesity in different areas in the world ***(Dwyer et al., 2000)*** for example**:**

A) The Eastern Mediterranean Region

It had been reported that, the status of overweight has reached an alarming level In the Eastern Mediterranean Region. A prevalence of 3%- 9% overweight and obesity has been recorded among preschool children, while that among school children was 12%-25%. A marked increase in obesity generally

has been noted among adolescents, ranging from 15% to 45%. Several factors, such as change in dietary habits, socioeconomic factors, inactivity and multiparity (among women) determine obesity in this Region. There is an urgent need for national programmes to prevent and control obesity in the countries of the Region ***(Musaiger, 2004).***

B) Egypt

The relationship between body weight and body image in a convenience sample of rural and urban girls had been compared. Using the Centers for Disease Control and Prevention reference standards, 35% of the girls were > 85^{th} percentile, while 13% were > 95^{th} percentile. Overweight was more prevalent in urban than rural girls and in those with higher socio-economic status than in lower socio-economic status girls ***(Jackson et al., 2003)***.

Causes and risk factors:

Although there is no definitive explanation for the recent epidemic of obesity, the evolutionary hypothesis comes closest to providing some understanding of this phenomenon ***(Diets, 1998).***

Obesity is generally a result of a combination of factors:

a) Exogenous obesity (simple obesity):

- Energy- rich diet (dietary pattern)
- Limited exercise (physical activity)

- Genetic predisposition
- Environmental factors
- Social, socioeconomic status and racial causes
- Maternal factors and the home environment
- Underlying illness
- An eating disorder (such as binge eating disorder)
- Stressful mentality
- Medication-related ***(Levine et al., 2012).***

b) Endogenous obesity:

- Endocrinal disorders
- Congenital syndromes ***(Levine et al., 2012).***
- Chromosomal abnormalities Although many people may have a genetic propensity towards obesity, it is only with the reduction in physical activity and a move towards high –caloric diets of modern society that it has become widespread ***(Thompson et al., 2013).***

- **Dietary patterns:**

As with physical activity, data on the dietary patterns of Native American and Asian youth and adults are lacking. Most obese people overeat and eat food that is high in dietary fat. Most of this fat is stored in the body rather than used for energy. There is little information on the dietary habits of Asian Americans in relation to obesity ***(Thompson et al., 2013).***

A few studies have identified several dietary practices that may contribute to obesity among Native Americans ***(Benzies and Yates, 2013).*** These include the wide use of butter, whole milk, fry bread, fried meats and vegetables, the generous use of fats in the preparation of beans, and high consumption of sugary beverages ***(Pollock et al., 2012).*** The proliferation of "Fast food" restaurants and convenience food stores on or near reservations also encourages the consumption of high - fat, high – sugar foods. In addition, many of the commodity foods that are used widely on reservations are high in fat. Poverty also limits access to a variety of healthful foods ***(Benzies and Yates, 2013).***

National Growth and Health study (NGHS) data found that African –American girls were more than twice as likely as white girls to engage in certain dietary practices associated with weight gain, such as eating while viewing television or while doing homework ***(Reed et al., 2013).***

Associations between dietary patterns and BMI have been reported among Hispanic children. in a study involving 173 Mexican – American children aged 9 years, the children were found to have higher percentage of body fat than were non-Hispanic white children, higher than recommended dietary fat intake, and lower than recommended fruit and vegetable intake ***(Sharkey et al., 2012).***

Overweight in children has also been linked to the preference for high fat foods, especially if parents have a preference for such foods ***(Shin et al., 2013).***

- **Physical Activity :**

There is *inversely proportion* between the physical activity and obesity prevalence. Increased T.V viewing and computer games have been associated with body fatness in children of varying ethnicity in some but not all studies ***(Goldfield et al., 2013).***

Average physical activity levels tend to be lower among African and Hispanic than white children and white children and adolescents ***(Gordon et al., 1999).***

- **Genetic factors:**

It is thought that genes are responsible for between 25-40 per cent of all cases of obesity; while the rest is determined by environmental factors appear to play a role. It is difficult to contribute obesity to just one factor ***(Chagnon et al., 2000).***

For instance the obesity **gene map** lists at least 15 chromosomal loci (region of chromosomes) for body weight, body fat, fat pad weight(white adipose tissue),and other obesity related traits in humans and 98 such loci in animal models ***(Ravussin et al., 2000).***

Genes known to cause obesity:

Molecular and genetic studies of human and mice have demonstrated and existence of a large and diverse collection of

genes that can influence fat mass by peripheral and central effects. Many of these genes act in known pathways, have unknown mechanisms of action ***(Ravussin et al., 2000).***

The underlying hypothesis for using these advances is that obesity is a heterogeneous disease, with multiple mechanisms that independently or synergistically increase fat mass. Thus diagnosis of the specific mechanisms that cause obesity in each individual may allow for treating each person's underlying problem specifically ***(Barsh et al., 2000).***

However many newly discovered obesity genes are expressed in peripheral tissues, including leptin, b3-adrenergic receptor, Hgmic, protein tyrosine phosphates 1B, diacylgly-cerolacyl transferase-2, perilpin, Bardet-Biedl, and the Dunnigan lipodystrophy ***(Ravussin et al., 2000).***

Seven genes are known to cause human obesity eg. (*leptin obesity gene* and *melanocortin*) and at least 20 genes are known to influence fat accumulation in mice ***(Farooqi et al., 2000).*** Several principles have emerged from studies of obesity genes:

1- Mammals can become obese by many mechanisms.

2- Most human homologues of mouse obesity genes cause human obesity. thus studies of mice have been a powerful predictor of human obesity genes ***(Go et al., 2014).***

3- Only some of the genes that may cause obesity will be useful as drug targets.

4- Most common human obesity is caused by the interactions of multiple genes. Thus despite greater advances in the understanding of the biology of obesity, *no single gene* is known to cause common obesity, except (possibly) melanocortin receptor (MCR) 4(MC4R).

The *leptin obesity gene pathway* illustrates the general principles of obesity biology and *melanocortin pathway* also contains several human obesity genes. Increased leptin, resulting from increased adipose mass causes decreased food intake and increased energy expenditure, which tend to return adipose mass to the individual 's set point Thus the leptin and leptin receptor are a part of a feedback loop. The adipose mass set point is different in obese people, however, perhaps because of resistance to leptin action ***(Dubern and Clement, 2012).***

Although the absence of leptin can cause obesity in humans and mice, most obese humans have an excess of leptin – body weight and plasma leptin are correlated positively ***(Rosas-Vargas et al., 2011).***

Identification of the patients and families that have mutation in obesity genes has many clinical implications. Identifying of the patients and families early in childhood or as soon as possible allows clinicians to institute education, preventive measures, and intervention earlier so that the problem will not be as great for the child or the child will not become as obese ***(Davis et al., 2014).***