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Prospective Incidence Study of Diabetes Mellitus in Morbidly Obese Saudi Patients

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Prospective Incidence Study of Diabetes Mellitus in Morbidly Obese Saudi Patients

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Abstract

Objective: The aim of this study is to evaluate the association between obesity and diabetes mellitus in a sample of morbidly obese Saudi patients.

Design: 201 morbidly obese patients undergoing surgery for obesity were preoperatively assessed. Assessment included complete blood picture, liver enzymes, lipid profile, blood sugar and hormones. Blood pressure was measured and liver ultrasound was done.

Results: 198 patients were enrolled in the study, from which 46 persons (23.23%) were diabetics and 22 (11.11%) were hypertensive. The body mass index (BMI) of both diabetic and non diabetic groups was of significance (p-value = 0.108). Obesity has proven to appear more in childhood 141 (71.21%), followed by in adults 30 (15.15%) and then at the age of puberty 17 (8.58%). There was a high significance (p-value = 0.005) in morbidly obese hypertensive patients having diabetes than in morbidly obese patients with normal blood pressure and do not suffer from diabetes.

Conclusion: Obesity is becoming a major health problem as it is considered a risk factor in metabolic diseases. It is also becoming more popular in children increasing the incidence of its morbidity disorders due to the longer exposure. Abdominal obesity is a recognized risk factor for both type 2 diabetes mellitus and cardiovascular disease resulted in the metabolic consequences of obesity, such as insulin resistance and impaired glucose tolerance. In summary, fatty liver is relatively common in overweight and obese volunteers with type 2 diabetes mellitus (DM) and is an aspect of body composition related to severity of insulin resistance, dyslipidemia, and inflammatory markers.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems.[i]

Body mass index (BMI), a measurement which compares weight and height, defines people as overweight (pre-obese) when their BMI is between 25 kg/m2 and 30 kg/m2, and obese when it is greater than 30 kg/m2.[ii]

Obesity is most commonly caused by a combination of excessive dietary calories, lack of physical activity, and genetic susceptibility, although a few cases are caused solely by genes, endocrine disorders, medications or psychiatric illness.[iii] [iv]

Obesity has reached epidemic proportions globally, with more than 1 billion adults overweight - at least 300 million of them clinically obese. The health implications posed by this condition involve a wide spectrum of disease states, including diabetes, steatohepatitis/nonalcoholic fatty liver disease (NAFLD), cholelithiasis, and hypertension, as well as neuromuscular and cardiovascular complications.[v]

A significant association between DM and obesity has been noted in several epidemiological studies. Considerable evidence has suggested that excessive weight gain is the most common cause DM. This association has been observed in several populations, in different regions of the world. Obesity-hypertension, a term that underscores the link between these two deleterious conditions, is an important public health challenge, because of its high frequency and concomitant risk of cardiovascular and kidney diseases.[vi]

Our aim in this study was to evaluate the current evidence of the association between Obesity and DM. In this paper we discuss the relation between morbidly obese patients and their prevalence of having DM.

There is no simple solution to the epidemic of obesity. Its origin lies in our culture and society, and is epitomized by the suburban mall, with its drive-through fast-food restaurants.[vii] The primary treatment for obesity is dieting and physical exercise. To supplement this, or in case of failure, anti-obesity drugs may be taken to reduce appetite or inhibit fat absorption. In severe cases, surgery is performed or an intragastric balloon is placed to reduce stomach volume and/or bowel length, leading to earlier satiation and reduced ability to absorb nutrients from food.

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Methods

It is a registry study; it recruited 198 morbidly obese patients who have undergone preoperative blood tests, liver ultrasound to prepare for surgery.
Different tests were done for preoperative assessment which includes blood tests e.g. Hb Level, blood sugar, TG, SGOT, SGPT, GGT, alkaline phosphatase, serum albumin and bilirubin, T4, TSH and the levels of cortisone both in the morning and evening. Blood pressure is measured and liver ultrasound done.
Enrolled patients were evaluated to see the incidence of DM in obese patients.
The data was analyzed based on; Overall and DM (Diabetic and Non-Diabetic) to see if there is any significant difference between study groups.

Statistical Methodology

Frequency statistics (number, percent) were mainly calculated for all the measurements. Comparability was assessed using chi-square test for categorical variables, like sex, etc. and t-test for continuous variables, like age.

Discussion and Results

Insulin resistance in obesity is strictly related to the development of, IGT[i], hepatic steatosis, as well as to the combination of these factors, also known as metabolic syndrome[ii]. Furthermore, insulin resistance is associated with systemic inflammation, endothelial dysfunction, early atherosclerosis and disordered fibrinolysis. It is alarming that these metabolic and cardiovascular complications are already found in obese children and adolescents. The presence of these alterations in prepubertal children is then particularly worrying, as insulin resistance and related complications might be further exacerbated by the influence of puberty, due to the physiological decrease in insulin sensitivity associated with normal pubertal development[iii].
Obese children with a similar BMI can differ on the basis of the degree of insulin resistance in the risk for complications. In fact, those with a more impaired insulin sensitivity show, for example, a greater risk for type 2 diabetes mellitus (T2DM) and cardiovascular disease. It has also been clearly shown that insulin resistance in childhood can track in adult life. A recent study has shown that insulin resistance at the age of 13 years predicts insulin resistance at age 19, independently of BMI, and is also associated with cardiovascular risk in adulthood[iv].
Figure (1) shows the incidence of Diabetes and Fatty Liver in our sample.
As mentioned before, obesity is most commonly caused by a combination of excessive dietary calories and genetic susceptibility, although a few cases are caused solely by genes, endocrine disorders, medications or psychiatric illness.

Conclusion

Obesity may antedate and predict the development of hypertension. Even among subjects with normal or optimal blood pressure, the obese subjects are more likely to develop high blood pressure levels in the following years. The opposite can also be true. Hypertensive subjects are more likely to develop obesity than normotensive ones.

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Illustrations

Illustration 1

Results

Patients were divided into 2 groups according to their DM status, into diabetic and non diabetic patients. 46 (23.89%) were diabetic compared to 152 (76.76%) having normal blood sugar.

Table (1) shows the sample characteristics:

		Diabetic	**Non-Diabetic**	**P-Value**
Sex:	Males	15 (28.85%)	37 (71.15%)	0.964
	Females	31 (21.24%)	115 (78.76%)	
Age:	Mean ± SE	34.20 ± 1.52 years	28.99 ± 0.74 years	0.029
	Range	18 – 55 years	15 – 58 years	
BMI	Mean ± SE	53.23 ± 2.61	46.07 ± 0.67	0.283
	Range	39.66 – 98.03	29.39 – 76.85	
BMI	< 40	9	44	

Illustration 2

Discussion and Results

Discussion and results:

Table (2) shows the percentage of predisposing factors:

		Diabetic	Non-Diabetic	P-Value
Hyperphagia:	Yes	44 (95.65%)	149 (95.51%)	0.342
	No	2 (4.35%)	7 (4.48%)	
Sweet Intake:	Yes	32 (69.57%)	108 (69.23%)	0.346
	No	14 (30.43%)	48 (30.77%)	

As for the most at risk life population, we can say that it is the childhood. Childhood obesity is reaching epidemic proportions and represents the most important chronic disease in this age group. In the USA 15.8% of children between 6 and 11 years and 16.1% of adolescents have a body mass index (BMI) in the range of overweight[v]. Similar trends have also been observed in many European countries, where, based on the latest International Task Force criteria, overweight and obesity are present in 31.8% of school-aged children. Furthermore, the recent phenomenon of 'nutritional transition' with a 'westernization' of food, typical of many developing countries, has caused a significant rise in obesity even among populations that were unaware of this problem until some years ago[vi].

Childhood obesity is associated with an increased risk for several metabolic complications, such as insulin resistance, glucose intolerance and type 2 diabetes mellitus

Upon different medical studies it has been proven that Type 2 diabetes mellitus (DM) is closely associated with hypertension, and the presence of both the conditions results in a high risk for the development of cardiovascular disease (CVD) and as obesity is identified as one of the main risk factors of diabetes and fatty liver, we had to assess the samples' blood sugar level and their fat liver content in relation to their DM.

Table (4) shows the percentage of diabetic patients.

	Hypertensive	**Non-Hypertensive**	**P-Value**
Diabetics	10 (45.5%)	36 (19%)	0.005
Not Diabetics	12 (54.5%)	140 (81%)	

According to the above table there has been a high significance in the presence of diabetes in patients suffering from hypertension and those who has normal blood pressure.

The range of blood sugar in patients with hypertension is 110.48 ± 5.9 while in patients with normal blood pressure it is 104.1 ± 1.98 with high significance (p-value = 0.005).

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