Obesity and its Related Clinical and Biochemical Parameters in a Sample of Iraqi Type 2 Diabetics

***Tawfeeq F. AL-Auqbi M.B.Ch.B F.I.C.M.S/C.M ** Majeed A. Mustafa M.B.Ch.B FRCP**

OBJECTIVES: To assess the different clinical, biochemical changes and its correlation with obesity in type 2diabetics. **METHOD:** 2187 type 2 diabetic records of patients attending the National Diabetes Center (NDC) were reviewed and divided into four groups according to their BMI; Group A 630 non obese patients (<25 kg/m^2) , group B 832 patients (BMI 25 – 29.9 kg/m^2), group C 661 patients (BMI 30- 39.9 kg/m^2) and group D 64 patients (BMI > 40 kg/m^2). Data from the patients records were collected about the age, duration of DM, age at onset of diabetes, BMI, blood pressure, FBG, HbA_{1c}, B. urea, S. creatinine, S. cholesterol, S. triglyceride and S. uric acid. **RESULTS:** the mean age of these groups were respectively (54,56,56,and51 years), the mean duration of DM were (23,18,18 and16 years), the mean age at onset of DM (31,38,38 and 35 years). Hypertension was present in (23.1%, 22.8%, 26.1% and 28.1%) of the study groups respectively. The mean FBG was high at (191.3,191.0,184.0 and 184.1 mg/dl); similarly the mean HbA_{1c} was (10.8 %, 10.6 %, 10.3 % and12.0 %), the mean S. cholesterol was (218.8,212.0,218.2 and 253.0 mg/dl) and the mean S. triglyceride was (149.8,159.9, 172.0 and 168.0 mg/dl). While the mean B. urea was (34.2,32.1,32.7 and31.4 mg/dl), the mean S. creatinine was (0.7,0.7,0.7 and0.7 mg/dl), and the mean S. uric acid was (4.0,4.9,4.9 and 5.5 mg/dl) respectively. Correlation coefficient of the BMI means of the study groups found to be strongly correlated with hypertension, FBG, B. urea, S. cholesterol, S. triglyceride and S. uric acid(r =0.945, 0.866, 0.793, 0.881,0.755 and 0.940) respectively. Also there is a moderate correlation with age, HbA_{1c} and S**.** creatinine (r =0.664, 0.400 and0.658) respectively. **CONCLUSIONS:** Increasing prevalence of obesity and type 2 diabetes with age. Obesity wes very common among type 2 diabetics. Obesity in type2 diabetics had strong positive correlation with glycemic control parameters, CVD risk factors and renal function parameters.

Key words:
Obesity, type2 diabetes mellitus, age, BMI, FBG, HbA_{1c}, hypertension, s.cholesterol,s.triglyceride, B. urea, S. creatinine and S. uric acid.

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Introduction:

Obesity is a growing important risk factor which triggers major mass pathologies and major chronic diseases (1, 2). Diabetes mellitus, CVD and dyslipidemia continue to be the main health scourge of most developed countries and are becoming dominant in many populous areas of the developing countries (2). Obesity and type 2 diabetes, which is expected to increase with 40% in the next decade (3), became an increasing medical problem with it's associated disorders (4).

Obesity has many causes, each of which has variable genetic component (5). At one extreme are the kinds of obesity caused by single-gene mutations (6), obesity is a feature of at least 24 genetic disorders (7) such as Bardet-Biedle and Prader-Willi syndromes (8), at the other extreme are the kinds of obesity caused by various diseases like Cushing syndrome, hypothyroidism, insulinoma and hypothalamic disorders (8). Obesity has major adverse effects on health; morbidly obese patients have as much as a twelve-fold increase in mortality (10). Insulin resistance of some degree is seen in 90% of patients with type 2 diabetes (11).

***Dr. Tawfeeq F. AL-Auqbi , National Diabetes Center (NDC), AL- Mustansyria University.**
**** Dr. Majeed A. Mustafa , National Diabetes Center (NDC), AL- Mustansyria University.**

Hyperinsulinemia and insulin resistance are a pervasive feature of obesity, increasing with weight gain and diminishing with weight loss. Obesity is a major risk factor for diabetes, about 80%of patients with type 2 diabetes mellitus are obese, and weight loss is associated with increased insulin sensitivity and improves glycemic control (12). In addition, it is well recognized that insulin resistance is associated with hypertension, hyperlipidemia and obesity (13, 14). Many disorders are associated with obesity like reproductive disorders in both men and women; Male hypogonadism is associated with increased adipose tissue, often distributed in a pattern more typical of females. Also, obesity is associated with menstrual abnormalities in women, particularly in women with upper body obesity. Most obese women with oligomenorrhea have the polycystic ovarian syndrome (PCOS), with its associated anovulation and ovarian hyperandrogenism; 40% of women with PCOS are obese (15). The Framingham Study revealed that obesity was an independent risk factor for the 26-year incidence of cardiovascular disease in men and women including coronary disease, stroke, and congestive heart failure (CHF) (16). When the additional effects of hypertension and glucose intolerance associated with obesity are included, the adverse impact of obesity is even more evident (16). Obesity-induced hypertension is associated with increased peripheral resistance and cardiac output, increased sympathetic nervous system tone, increased salt sensitivity, and insulin-mediated salt retention; it is often responsive to modest weight loss (17). Moreover, there is a long list of disorders associated with obesity like pulmonary diseases, gallstone formation, colo-rectal and prostatic cancers and diseases of the bones, joints ad skin. Age and duration of obesity was additional risk factors for hypertension, dyslipidemia and diabetes (3,18). Body weight and obesity can be simply classified into under-weight, normal (desired) weight, over-weight, obesity, and morbid obesity according to the BMI <19, 19-24.9, 25-29.9, 30-39.9 and>40 Kg/m^2 respectively. (1, 3,19).

Objectives:

The aim of the study is to assess the clinical and biochemical parameters related to obesity and CVD risk actors in type 2 diabetics and its correlation with body weight.

Patients and method:

Records of 2187 type 2 diabetic patients attending the National Diabetes Center (NDC), AL-Mustansyria university, were reviewed and divided into four groups according to their BMI; Group A (not obese, BMI<25 kg/m^2) included 630 patients; group B (grade I obesity, over-weight, BMI 25 – 29.9 kg/m^2) included 832 patients; group C (grade II obesity, 30- 39.9 kg/m^2) included 661 patients and group D (morbid obesity, grade III obesity, BMI > 40 kg/m^2) included 64 patients (20,21). Data were collected from the records of these 2187 patients regarding their age, duration of illness, age at onset of diabetes, body mass index (BMI), blood pressure to identify the hypertensive patients, fasting blood glucose (FBG), HbA_{1c}, B. urea, S. creatinine, S. cholesterol, S. triglyceride and S. uric acid. Simple linear correlation and regression model was applied to study the correlation between BMI and different studied parameters.

Results:

Reviewing the patients records show that the age (mean ± SD) of the four groups were (54±15,56±12,56±12 and 51±16 years) respectively, the mean of age at the onset of diabetes were (31,38,38 and 35 years) with mean of duration of illness were (23,18,18 and16 years). Hypertension accompanied with diabetes among the four studied groups in the following percentages 23.1%, 22.8%, 26.1% and 28.1% (see fig.2).

All the study groups have a poor glycemic control as shown by the high means of FBG and HbA_{1c} (see table -1). Also in most of the study groups, s.cholesterol and s.tryglyceride were considered as high risk groups according to European Diabetes Policy Group guideline, the risk groups level for s.cholesterol and s.tryglyceride were 185-230 and150-200 mg/dl respectively (22) (see table-1). The B.urea, s.creatinine, and s.uric acid mean ± SD were within normal limits (see table-1). Simple linear correlation and regression model (23) showed that BMI was strongly correlated with the presence of hypertension, FBG, B.urea, s.cholesterol, s.triglyceride and s. uric acid as far the correlation coefficient r=0.945, 0.866, 0.793, 0.881, 0.755 and 0.94 respectively. Also by the same model BMI show moderate correlation with the age, HbA_{1c} and s.creatinine, where the correlation coefficients were r= 0.664, 0.4 and 0.658 respectively.

Discussion:

Few years ago type2 diabetes mellitus was called maturity onset diabetes mellitus because of the close relation between the age and the onset of the disease which is quite demonstrated in our studied sample, the age of the patients mean±SD was 55±15 years with mean±SD duration of illness 23±18 years, while the mean of age at the onset of the disease were 31, 38, 38 and 35 years respectively. Lantion-Ang found the mean of age was 59 ± 12 years and the mean duration of illness was 9.4 ± 0.7 years among his western pacific population, Philippines diabetic patients (24). That means the onset of illness in our sample was earlier than that observed in diabetic patients from other far away societies from Middle East.

Obesity was very common, as 71.2 % of the patients had BMI > 25kg/m^2, groups B, C, and D; and just 28.8 % of the patients were non-obese, group A, BMI ≤ 25kg/m^2. Simple comparison with Saudi study by Al-Turki where the obesity prevalence among adult diabetics were 81%, BMI > 25kg/m^2 (25); In contrast Lantion-Ang study showed that 60 % of patients had BMI ≤ 25kg/m^2 (24), we can easily found that obesity was more prevalent and common among our diabetic patients in Middle East.

The simple linear correlation and regression model (23), was applied on the study population, it proved the strong positive correlation between the BMI and glycemic control parameters, fasting blood glucose (FBG) and mean values of HbA_{1c} were the coefficient correlation r=0.866 and the mean of HbA_{1c} were 10.8%, 10.6%, 10.3 and 12.0% for the four groups respectively. Tsuzuki study, as well, prove the impact of age and obesity on the probability of diabetes by using multivariante logistic analysis (26).

Obesity was found, by simple linear correlation and regression model, to be strongly correlated with ischemic heart disease (IHD) risk factors such as hypertension, s.cholesterol and s.triglyceride where the coefficient correlation were r=0.845, 0.881 and0.755 respectively. These finding proved as well by Pontiroli study (18) when he proved by using univariante analysis the progressive increase of duration of obesity, hypertension and hyperlipidemia with the level of fasting blood glucose (FBG) and HbA_{1c} among the study population.

The simple linear correlation and regression model proved the correlation between obesity in type2 diabetes mellitus and renal function parameters such as b.urea, s.uric acid and s.creatinine where the coefficient correlation were r=0.793,0.940 and 0.658 respectively.

Conclusions:

- Prevalence of obesity and type 2 diabetes mellitus were increasing with age, mainly during the 6^{th} decade of age and older.
- Obesity was very common among Iraqi type2 diabetics attending the NDC.

- Obesity, BMI, in type2 diabetics had strong positive correlation with the following parameters:
  - glycemic control parameters, FBG, and $HbA_{1c.}$
  - CVD risk factors, hypertension , s.cholesterol and s.triglyceride.
  - renal function parameters, which are B.urea, s.uric acid and s.creatinine.

As far obesity is the major risk factor for Type 2 diabetes, CVD and other related disorders and complications; it is possible to improve health and diabetic control by caloric restriction, weight loss, exercise and drug therapy.

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Fig. 1: The mean of age, Age at onset of diabetes and duration of illness (years) of the four diabetic studied groups.

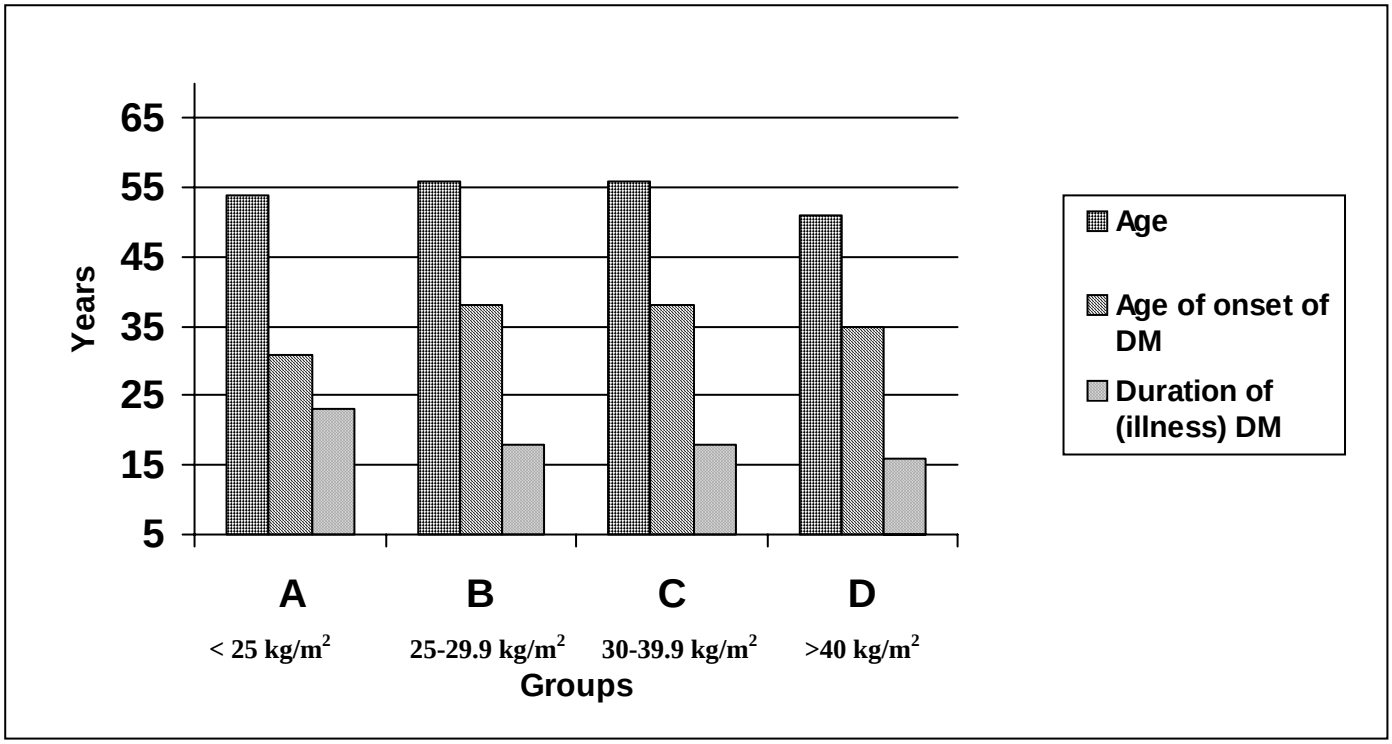

Fig. 2: Prevalence of hypertension per each studied group

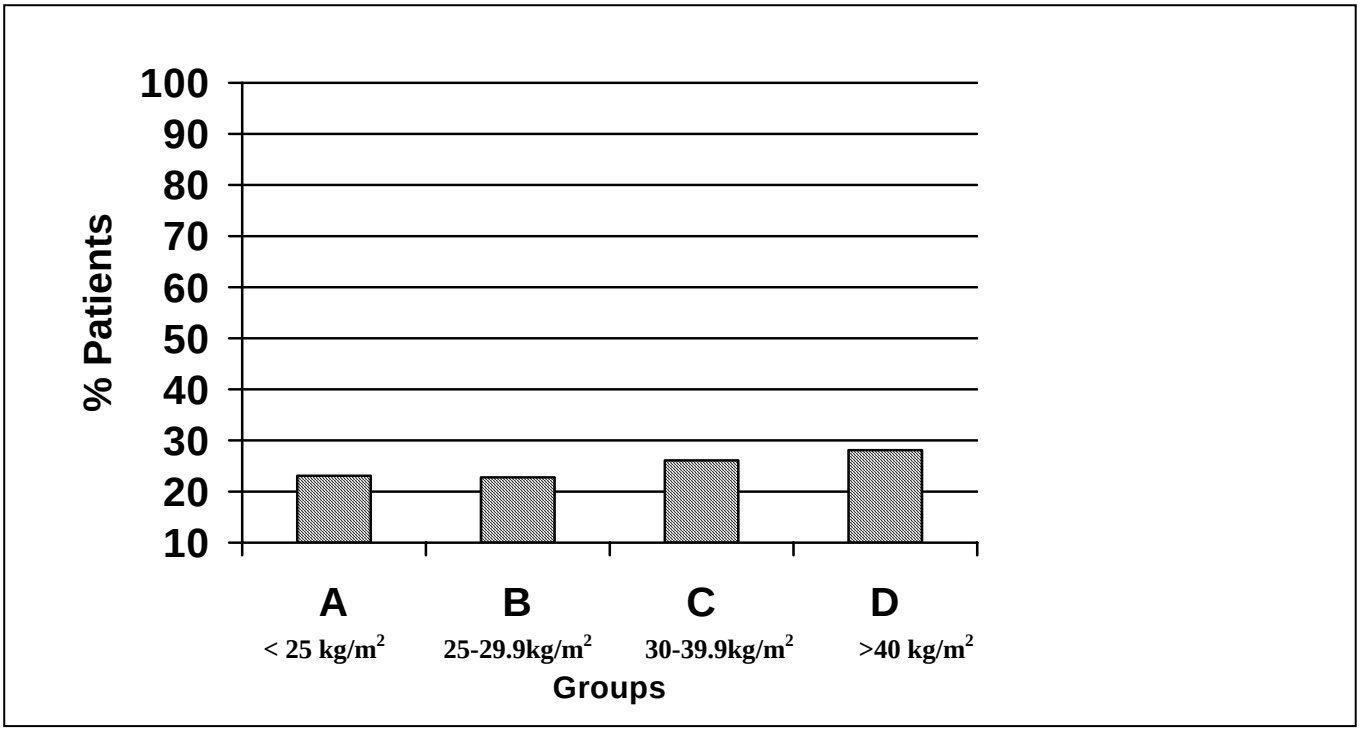

Table 1: The mean ±SD of biochemical parameters of studied groups.

	A <25 kg/m^2	B 25-29.9 kg/m^2	C 30-39.9 kg/m^2	D >40 kg/m^2
AGE mean ±SD (years)	54 ±15	56 ± 12	56 ± 12	51 ± 16
BMI mean ±SD (kg/m^2)	21.7 ± 3.0	27.6 ± 1.4	33.2 ± 2.5	44.7 ± 4.9
FBG mean ±SD (mg/dl)	191.3 ± 76.7	191.0 ± 74.8	184.0 ± 86.0	184.1 ±59.3
HbA1c %	10.8 ± 4.0	10.6 ± 3.4	10.3 ± 3.8	12.0 ± 4.1
S.cholesterol mean ±SD (mg/dl)	218.8 ± 52.3	212.0 ± 56.4	218.2 ± 53.9	253.0 ± 78.7
S. triglyceride mean ±SD (mg/dl)	149.8 ± 72.7	159.9 ± 71.7	172.0 ± 78.1	168.0 ± 0.0
B. urea mean ±SD (mg/dl)	34.2 ± 22.0	32.1 ± 12.9	32.7 ±18.6	31.4 ±7.0
S. creatinine mean ±SD (mg/dl)	0.7 ± 0.4	0.7 ± 0.4	0.7 ± 1.1	0.7 ± 0.3
S. uric acid mean ±SD (mg/dl)	4.0 ±4.9	4.9 ±1.9	4.9 ± 0.9	5.5 ± 0