Detection of insulin resistance in overweight and obese individuals

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Abstract

Background and objectives: This study was designed mainly to determine fasting serum insulin level and other parameters related to obesity, since Type II diabetes mellitus is the most prevalent problem associated with obesity. In Kurdish region, no previous studies about insulin essay in overweight and obese individuals have been executed. Measuring insulin level in overweight and obese individuals can give information about the body's sensitivity to insulin.

Methods: Fasting blood samples were derived from (60) overweight individuals (30 males + 30 females) and from (30) normal weight individuals and were analyzed for insulin level by using an immuno assay method (ELISA method) whereas fasting blood glucose, Triglyceride(TG), Total Cholesterol(TC). High Density Lipoprotein(HDL), were estimated spectrophotometrically.

Results: From total (60) overweight individuals 76.6% have insulin resistance. From this percent about 52% of those individuals were with family history of diabetes and 24% were with family history of obesity.

Conclusion: Three relatively simple metabolic markers can identify overweight and obese individuals who are sufficiently insulin resistant to be at increased risk for various adverse outcomes are (TG level, ratio of TG to HDL, and insulin level).

Key words: Fasting serum insulin, blood glucose, fasting serum (TC, TG and HDL).

Introduction

Insulin resistance is defined as the inability of body cells to use insulin in the uptake of blood glucose, or is the condition in which normal amounts of insulin are inadequate to produce a normal insulin response from fat, muscle, and liver cells[1]. Insulin resistance is a key pathogenic parameter observed in the natural history of type II diabetes[2, 3]. Development of insulin resistance results in compensatory hyperinsulinemia, a state that is maintained until pancreatic secretary defects occur. However, once β-cell dysfunction occurs, inability to compensate for the increased insulin resistance results in hyperglycemia and the diagnosis of typeII diabetes is made on clinical grounds[4]. In many patients the transition from "non-diabetes" to "diabetes" does not occur directly, they develops an intermediate state where glucose levels are not quite high enough to be termed diabetic, but are not normal either, this condition is described as "pre-diabetes" or "impaired fasting glucose". People with pre-diabetes are at increased risk for developing type II diabetes, heart disease, stroke, and eye disease[5, 6].

Aims of the study:

1. To identify individuals with insulin resistance using common laboratory tests.
2. To study the strong relationship between insulin resistance and type II diabetes.

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3.Early identification of individuals with insulin resistance can provide a treatment way for preventing or delaying the development of type II diabetes and other health problems.

Methods

Blood samples were obtained from (60) overweight and obese individuals (30 males and 30 females). The average age was (41.86 ± 0.98) years (Mean ± S.E.M) and the range of age were (30 – 66) years. The results obtained were compared with (30) normal weight individuals (15 males and 15 females). The average age was (37.6 ± 1.62) years (Mean ± S.E.M) and the range of age were (30 – 65) years. All individuals had no diabetes, they were apparently healthy individuals. Blood samples were converted into serum for estimation of insulin by an enzyme immmunoassay method (using Elisa instrument), whereas Glucose; TG; TC and HDL were estimated by an enzymatic colorimetric method (using spectrophotometer).

Result

Figure (1) provides the mean fasting serum insulin levels in the control and case groups. The results obtained reveal that the mean fasting serum insulin levels were (7±0.55)mU/L, (11.5±0.63)mU/L in control and case groups respectively, the values obtained in case group significantly exceed those obtained in control group (p<0.01). There was no significant difference between the mean F.S.Insulin levels of males and females in case group (Figure 1).
Figure (2) presents the mean fasting serum glucose levels in control and case groups. The mean F.S.Glucose levels in control and case groups were (102±2.65) mg/dl, (105±1.8) mg/dl respectively. There was no any significant difference between the mean F.S.Glucose of control and case groups also without any significant difference between the mean F.S.Glucose of males and females in case group (Figure, 2).

The mean fasting serum triglyceride levels in control and case groups were (104±6.3) mg/dl, (182±10) mg/dl respectively. The values obtained indicate that the mean fasting serum triglyceride levels of case group was significantly higher than that of control group (p<0.01) (Figure, 3). There was no significant difference between the mean F.S.TG of males and females in case group as presented in (Figure, 3). The mean triglyceride to HDL-C ratio in control and case groups were (2.28±0.179), (4.77±0.34) respectively. This value is significantly higher in case group than in control group (p<0.01) (Fig., 4), and at the same time there was a significant difference in the mean of TG/HDL-C ratio between males and females of case group (Figure, 4).
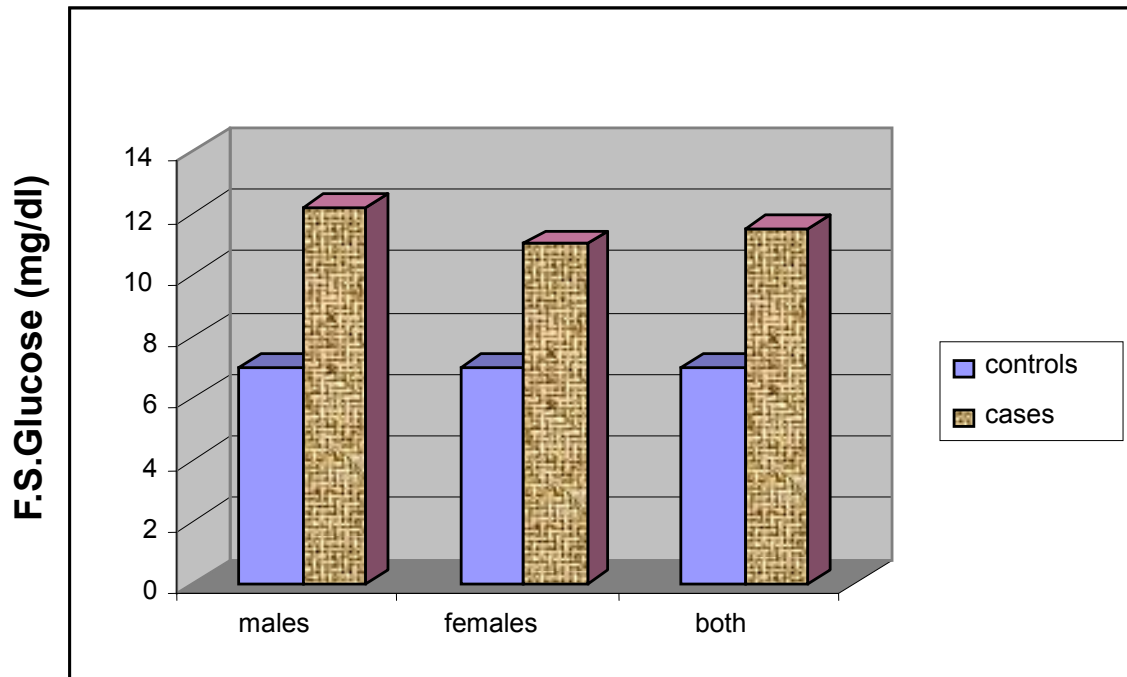
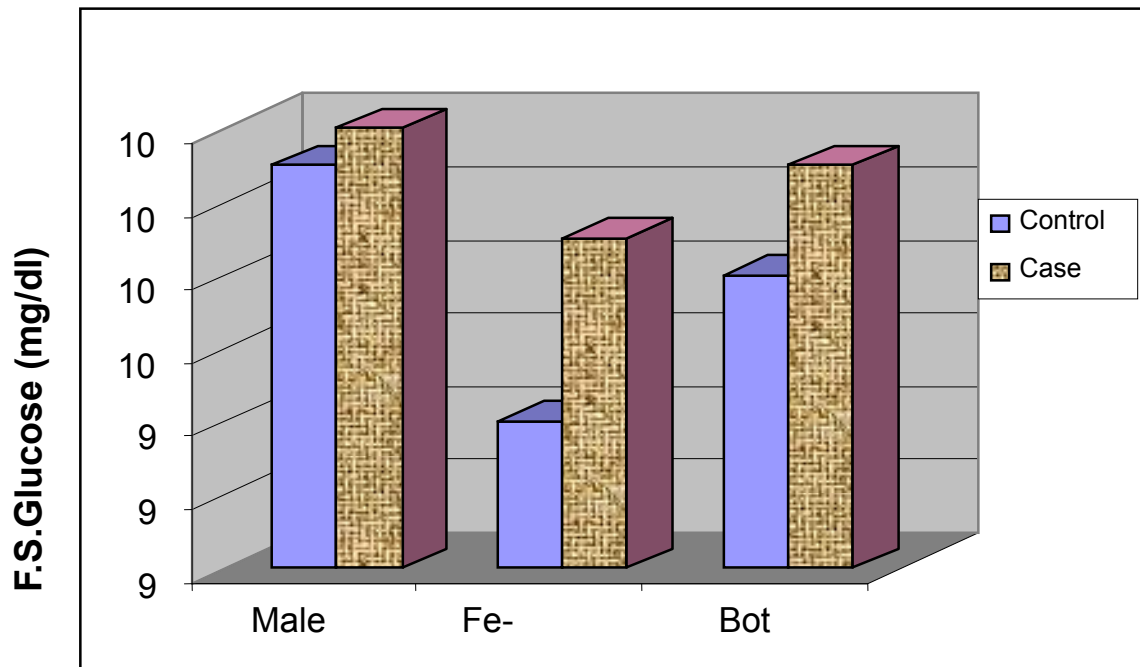**Figure (1):** Fasting serum insulin in (mU/L) of both groups.
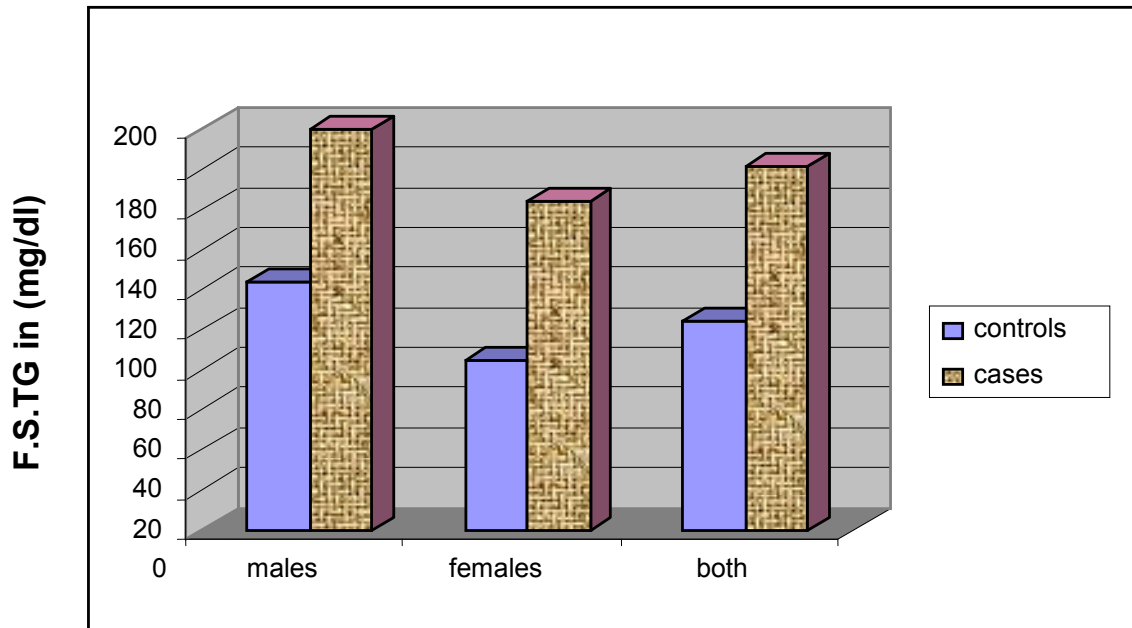

Figure (2): Fasting serum glucose in (mg/dl) of both groups.

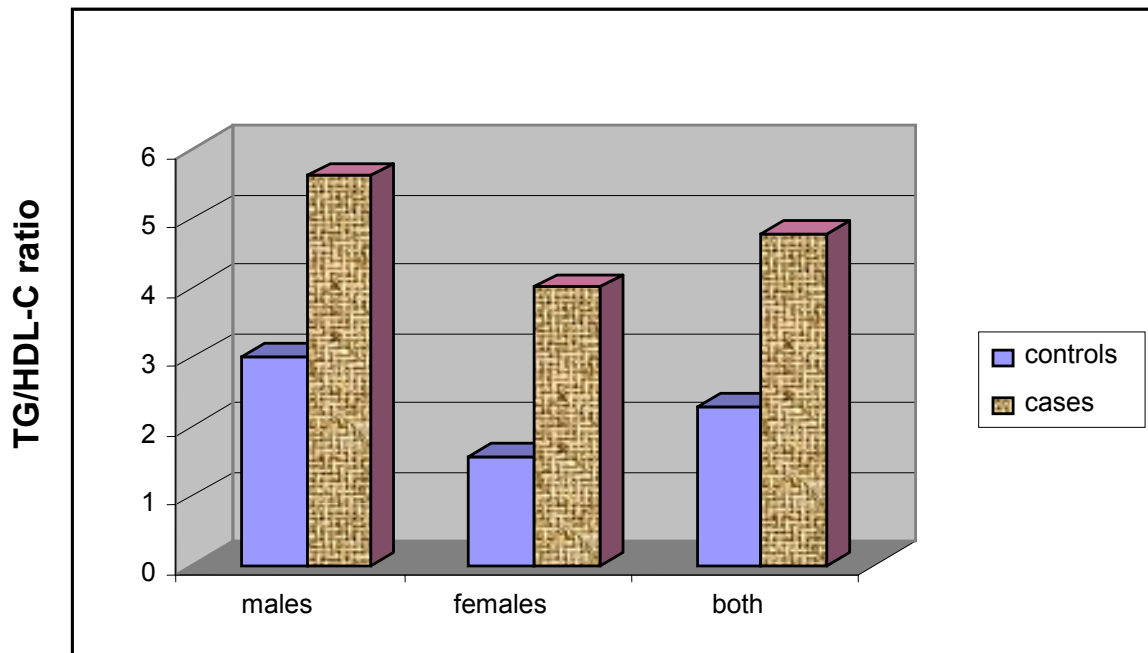**Figure (3):** Fasting serum triglyceride in (mg/dl) of both groups.

Figure (4): TG/HDL-C ratio of both groups.

Discussion

The results of the study suggests that the tests were most useful for identifying insulin resistance plus serum triglyceride concentration, ratio of triglyceride to high density lipoprotein cholesterol concentrations, and insulin concentration. Measuring of fasting insulin level can give information about the body's sensitivity to insulin[2]. High insulin, even with normal blood sugar, may indicate that the pancreas is working harder than normal to get the blood sugar level down[5]. This situation is usually caused by the body being resistant to insulin's effect. Since it is easy to measure triglyceride and HDL-Cholesterol levels, physicians might consider using these tests to predict whether their overweight patients are likely to have insulin resistance. All individuals under study did not have type II diabetes but most of them have "insulin resistance".

Individuals with insulin resistance do not have the high blood sugar levels that occur in those with type II diabetes, but their bodies must produce large amounts of insulin to keep sugar levels normal[2, 6]. Insulin resistance can lead to type II diabetes and heart disease[7, 8].

Losing weight can improve insulin resistance and prevent type II diabetes and heart disease.[9] The study proved that about 76.6% of (60) overweight and obese individuals have insulin resistance according to criteria proposed by National Cholesterol Education Program/Adult Treatment Panel III for the diagnosis of insulin resistance. From this percent about 52% of those individuals were with family history of diabetes and 24% were with family history of obesity, and this is in acceptable with one of these risk factors associated with insulin resistance which is family history of diabetes and/or obesity.

Conclusion

The most important conclusions observed in this study can be summarized as the follows:
1. Three relatively simple metabolic markers can help identify overweight and obese individuals who are sufficiently insulin resistant to be at increased risk for various adverse outcomes (TG level, ratio of TG to HDL-C, and insulin level).
2. Most individuals with insulin resistance were at risk with (e.g. family history of diabetes, a sedentary lifestyle, a large abdominal girth of more than 102cm for men and 88cm for women).
3. Most individuals with insulin resistance were prediabetes. For many patients insulin resistance does not occur in isolation, it exists as part of "insulin resistance" a cluster of abnormalities that include abdominal obesity, high blood pressure and changes in blood fats [total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C)].

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