

PREVALENCE OF INSULIN RESISTANCE IN TYPE-2 DIABETIC PATIENTS

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ABSTRACT

Objective: To determine the prevalence of insulin resistance in patients of type-2 diabetes mellitus in population of NWFP, using the National Cholesterol Education Program Adult Treatment Panel-III definition of insulin resistance, (modified for Asians)

Material and Methods: This analytical study was performed in Fauji Foundation Hospital and Hayatabad Medical Complex Peshawar. Two hundred and eighty patients of type-2 diabetes mellitus of age 30 or above were included from the hospital OPD and wards. Those patients, who were having high waist circumference because of reasons other than abdominal fat like pregnancy, ascites, abdominal tumors etc, were excluded from the study. Patients with severe infection and inflammatory conditions were also excluded. All the patients were examined for waist circumference and blood pressure, and investigated for fasting blood sugar, triglyceride and S HDL. The above mentioned criteria was applied to know whether a patients is insulin resistant or not.

Results; Two hundred & eighty patients of Type-2 diabetes mellitus were collected randomly from the hospital OPD. Ninety-five were males and 185 were females. Seventy eight percent 78% (n=219) of the patients were fulfilling the criteria for metabolic syndrome (insulin resistance). The prevalence of metabolic syndrome was almost equal in male 77% (n=73) and females 79% (n=146). The ratio of central obesity was more in the females 78% (n=144) than in the males 70% (n=67). The total prevalence of hypertension was 71% (n=199). The ratio of hypertension was more in the male 75% (n=71) than in the female 67% (n=124).

Conclusion; Insulin resistance is very common in type-2 diabetes mellitus. Treating the insulin resistance with insulin sensitizing drugs will prove beneficial regarding the diabetic control and prevention of its macro vascular complications.

Key words: Type-II diabetes mellitus, insulin resistance, Metabolic Syndrome, hypertension.

INTRODUCTION

There is a global epidemic of diabetes mellitus in the recent years. According to WHO report, there were 177 millions of diabetics in year 2000 and it is estimated to be 366 millions in the year 2030.³ According to another study Indopak would rank first in its share to the global diabetes.⁴ S M sohail etal reports 9 millions diabetics in Pakistan up to 2006.⁵

Type-2 diabetes mellitus is the commonest type of diabetes mellitus, which accounts for about 90% of the diabetic patients.^{4,6} Because most of the type-2 diabetic patients remain undiagnosed, the above statistic may be an underestimate of the true

prevalence of type-2 diabetes mellitus. Type-2 diabetes mellitus mostly presents in adult life but may be found in teenager and children as well.³

The two interrelated, genetically determined pathophysiological defects of type-2 diabetes mellitus are insulin resistance and beta cell dysfunction which ultimately lead to hyperglycemia. Thus both of the above conditions may precede the development of type-2 diabetes mellitus by many years.^{7,8}

The concept of insulin resistance in type-2 diabetes mellitus was first advanced by Harold Percival Himsworth of the university college hospital medical center in London in 1936.⁹ Insulin

TABLE SHOWING THE PERCENTAGES OF DIFFERENT ABNORMAL PARAMETERS

Uncontrolled Blood sugar		High waist circumference		Hypertension or High blood pressure		Low HDL		High triglycerid	
IR	Total n=168	IR	Total n=215	IR	Total n=199	IR	Total n=140	IR	Total n=166
88%	60%	91%	74%	71%	71%	77%	50%	61%	45%

IR- Fulfilling the criteria for insulin resistance.

Table 1

resistance can be defined as an impaired response to the physiological effects of insulin in the peripheral tissues like skeletal muscle and adipose tissues.^{10,11}

According to some studies, over seventy percent of the type-2 diabetic patients are insulin resistant.² This correlates with the ratio of obesity in type-2 diabetic patients. Insulin resistance may be present in the general population as well. It is estimated that about 18% of the general population is having insulin resistance.² It increases the risk for cardiovascular disease in the general population also.^{12, 13}

There are different pathophysiological mechanisms for insulin resistance. The role of adipose tissue products like free fatty acids, different adipokines (leptin and adiponectin) and TNF-Alpha are increasingly evident to be involved in the insulin antagonism.^{10, 13}

Insulin resistance increases the risk for cardiovascular disease through endothelial dysfunction, activation of coagulation cascade, increase blood pressure and deterioration of lipid metabolism independently of diabetes mellitus.¹⁴ Insulin resistance is one of the most important trigger to the development of type-2 diabetes mellitus. It is increased by factors like obesity, hypertension, dyslipidemia and sedentary life style.¹⁵

Since this is the central abdominal obesity which plays more significant role in the insulin resistance than the peripheral obesity, therefore recent criteria has replaced the BMI with the waist circumference for detecting insulin resistance.¹ The other parameters used in this criteria for detecting insulin resistance, are serum HDL, Triglyceride, Fasting blood sugar and hypertension. The reliability of these parameters is mentioned in the literature as well.⁷ There are multiple other methods used in the past for measuring the insulin sensitivity in the tissues, like Homeostatic Model Assessment (HOMA)^{16,17} and the short Insulin Tolerance Test (ITT).³ The gold standard for knowing insulin resistance is the Hyperinsulinemic

Euglycemic Clamp test. In this test the amount of glucose is measured which is required to compensate for an increase insulin level without causing hypoglycemia.^{18, 19, 20}

Recent studies have used the, clinically easily applicable, parameters like waist circumference, fasting blood sugar, blood pressure, triglyceride and serum HDL levels to know the insulin resistance in Asian population.² The same criteria was used in this study as well.

The aim of this study is to know the prevalence of insulin resistance in type-2 diabetic patients, using the National Cholesterol Education Program Adult Treatment Panel-III definition of insulin resistance syndrome¹, modified for Asians.²

MATERIAL AND METHODS

This analytical study was performed in Fauji Foundation Hospital and Hayatabad Medical Complex Peshawar from Jan. to Aug 2007. All patients were randomly collected from the hospital OPD and wards.

INCLUSION CRITERIA; All the patients with type-2 diabetes mellitus above the age of 30 years were included in this study.

EXCLUSION CRITERIA; Patients with the following conditions were excluded from the study. **1-**Patients with conditions like chronic inflammatory diseases and infections, which may temporarily increase the insulin resistance. **2-**Patients with ascites, abdominal hernias, tumors and other conditions which may increase the waist circumference without abdominal fat. **3-**Pregnant ladies.

The following examination and investigations were performed on all patients.

- Waist circumference.
- Blood pressure.
- Fasting blood sugar.
- Serum triglyceride.
- Serum HDL.

Care was exercised as not to count the same patient repeatedly on his/her next visits.

The National Cholesterol Education Program (Adults Treatment Panel III) definition for insulin resistance¹, modified for Asians² was applied to the patients in this study.

The criteria is given below;

- 1 Waist circumference 80cm or more in women and 90cm or more in men.
- 2 Fasting blood sugar level 110mg% or more or is on known treatment for diabetes mellitus.
- 3 HDL cholesterol level <50mg% in women and <39mg% in men.
- 4 Blood pressure 130/85 or more or is on known treatment for hypertension.
- 5 Triglyceride level 150mg% or more.

If three or more of the above factors are positive, the case was considered to be insulin resistant. This criteria is modified for Asian and was used in a study which was performed in Singapore.² This study was performed in different ethnic groups of Asians including Indians. We applied the same criteria to the type-2 diabetic patients only.

RESULTS

Two hundred and eighty patients were included in the study. Ninety-five were male and 185 were females.

Analyzing all the parameters given in the mentioned criteria, it was found that overall 78% (n=219) of the patients were having metabolic syndrome (insulin resistance syndrome). The ratio of insulin resistance was almost equal in males 77% (n=73) and females 79% (n=146). The tendency of abnormally high waist circumference was more in the female 78% (n=144) than in the male 70% (n=67). Seventy one percent 71% (n=199) of the patients were having hypertension or blood pressure reading more than the normal value given in the said criteria. Hypertension was slightly more prevalent in the male 75% (n=71) than in the female as mentioned above 67% (n=124).

Over all 55% (n=154) of the patients were having their blood pressure not controlled with the previous treatment they were using. The important reasons for their uncontrolled hypertension were poor compliance with the current medication and inefficacy of the medicines. This study also revealed that about 60% (n=168) of the patients were having poor control of their diabetic state. The most important reasons being the poor compliance for the drugs as well as poor diet

control.

Fifty percent (n=140) of the patients were having the HDL level lower than the one mentioned in the said criteria. Similarly about 45% (n=126) of the patients were having abnormally high triglyceride levels. Table-1 shows percentages of different abnormal parameters along with their contribution to the metabolic syndrome.

DISCUSSION

Insulin resistance plays major role in the development of type-2 diabetes mellitus. This study shows about 78% prevalence of insulin resistance in the patients of type-2 diabetes mellitus age 30 or above, in the population of NWFP. This figure is very high as compared to that in the general population which is about 18%² making the ratio of 4:1. Other studies also report high percentage of insulin resistance in type-2 diabetic patients. Some studies report it to be 90%¹², while according to some other studies performed on different ethnic groups of the Asian population using the same criteria, the ratio of insulin resistance in the patients of type-2 diabetes was 74%.² Another study performed in Pakistan using the WHO criteria for metabolic syndrome, reported 46% prevalence of insulin resistance in the patients of type-2 diabetes mellitus.⁵

This study shows about 74% prevalence of central obesity i.e. abnormally high waist circumference in the patients of type-2 diabetes mellitus. Since waist circumference is the best predictor of central obesity, so it predicts the insulin resistance as well. Other literature also mentions the role of central obesity in the causation of insulin resistance.²¹

Hypertension is also a frequently associated factor with insulin resistance and type-2 diabetes mellitus. In this study 71% of the type-2 diabetic patients were having hypertension. Some other study reports it to be 60-65%.²² This ratio is twice as common as that in the general population.²² In this study about 55% of the hypertensive patients were having their blood pressure uncontrolled because of poor compliance or inefficacy of their present medication. This ratio is mentioned as about 60% in the other literature.²³

In this study about 50% of the patients were having HDL level lower than the respective normal mentioned in the criteria. Similarly about 45% of the patients were having the triglyceride level above the normal levels. According to a study, diabetes mellitus and chronic inflammatory conditions lowers the HDL level and increases the triglyceride level. This study mentions about 45% prevalence of diabetes mellitus in the patients of

abnormal levels of HDL and triglyceride.²⁴

CONCLUSION

Insulin resistance syndrome is more frequently found in the patients of type-2 diabetes mellitus as compared to the general population. High waist circumference, diabetes mellitus and hypertension are the highly predictive parameters of insulin resistance syndrome. Overcoming the problem of insulin resistance in type-2 diabetic patients through using peroxisome proliferator activated receptor (PPAR γ) agonistic drugs, like thiazolidinedione, may prove very beneficial for the type-2 diabetic patients regarding both, the control of diabetes mellitus and the prevention of macro vascular complications of type-2 diabetes mellitus.

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