ORIGINAL RESEARCH

Assessment of HOMA – IR in apparently normal subjects

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ABSTRACT

Background: Prevalence of Diabetes has been on the rise dramatically over the past 2 decades, from an estimated 30 million cases in 1985 to 285 million in 2010. The present study was conducted to assess HOMA – IR in apparently normal subjects. **Materials & Methods:**120 apparently normal subjectsof both genders were selected. Blood pressure, weight and height and BMI were measured.Fasting plasma insulin was determined by the electro chemiluminescence assay.HOMA – IR was calculated by the formula, HOMA – IR = fasting Glucose (mg/dl) X fasting plasma Insulin (µU/mL)/405. **Results:** Out of 120 patients, males were 65 and females were 55.<18.5 kg/m^2 was seen among 45 and 18.5- 22.9 kg/m^2 was seen in 75 patients. The difference was significant (P< 0.05). The mean FBS was 83.6mg/dl, IR was 2.5, BMI was 19.1 kg/m2, SBP was 105.4 mm Hg and DBP was 73.6 mm Hg. There was positive correlation of HOMA – IR with age, BMI, SBP and DBP (P< 0.05). **Conclusion:** Indians have a higher mean HOMA-IR than other populations. The risk factors for coronary artery disease are directly correlated with HOMA-IR. Numerous cases of type 2 diabetes mellitus and coronary artery disease can be avoided by early diagnosis of those with significant insulin resistance.

Keywords: Diabetes,Insulin,Obesity

INTRODUCTION

Prevalence of Diabetes has been on the rise dramatically over the past 2 decades, from an estimated 30 million cases in 1985 to 285 million in 2010.[1] International Diabetes Federation prediction is that 438 million individuals will have diabetes by the year 2030. Although the prevalence of both type 1 and type 2 diabetes is on the rise worldwide, it is type 2 diabetes which is rising much rapidly, presumably because of increasing obesity, reduction in the activity levels as countries become more industrialized and aging of the population.[2]

Insulin resistance and abnormal insulin secretion are the 2 central pillars to the development of type 2 diabetes. Though the primary defect is controversial, most studies support the view that insulin resistance precedes an insulin secretary defect.[3]Another non – communicable disease epidemic that is going on worldwide is that of coronary artery disease. CAD is the single most common cause of death in men and women and the economic burden of CAD on any country is tremendous. The WHO estimates that by the year 2020 the global number of deaths from CAD will have risen from 7.1 million in 2002 to 11.1 million.[4]

Quantification of insulin resistance by HOMA – IR is more convenient. It is calculated by multiplying fasting plasma insulin (in micro units/ml) by fasting plasma glucose(in mg/dl), then dividing by the constant 4056.[5]Many studies have addressed a standardized reference range for HOMA – IR among different populations. But the non – availability of a standardized reference range for HOMA – IR among Indian population has limited its clinical and population application.[6]The present study was conducted to assess HOMA – IR in apparently normal subjects.

MATERIALS & METHODS

The present study consisted of 120 apparently normal subjectsof both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Parameters such as family history of diabetes mellitus, hypertension and coronary artery disease, smoking, tobacco chewing, alcohol consumption, and systemic steroids was obtained.Blood pressure, weight and height were measured. BMI was calculated according to the formula BMI = weight in kgs/(height in metres).[2]

Blood samples were collected after a 12 hour overnight fasting.Fasting blood sugar was determined by the oxidase - peroxidase method.Total cholesterol was measured by the cholesterol oxidase – peroxidase method. Triglyceride levels were assessed by glycerol phospho oxidase – peroxidise method.HDL and LDL cholesterol were measured by the direct enzymatic colorimetric assay.Fasting plasma insulin was determined by the electro chemiluminescence assay.HOMA – IR was calculated by the formula, HOMA – IR = fasting Glucose (mg/dl) X fasting plasma Insulin (µU/mL)/405.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 120		
Gender	**Male**	**Female**
Number	65	55

Table I shows that out of 120 patients, males were 65 and females were 55.

Table II Assessment of BMI

BMI	Number	P value
<18.5 kg/m^2	45	0.05
18.5- 22.9 kg/m^2	75	

Table II, graph I show that <18.5 kg/$m^2$was seen among 45 and 18.5- 22.9 kg/m^2 was seen in 75 patients. The difference was significant (P< 0.05).

Graph I Assessment of BMI

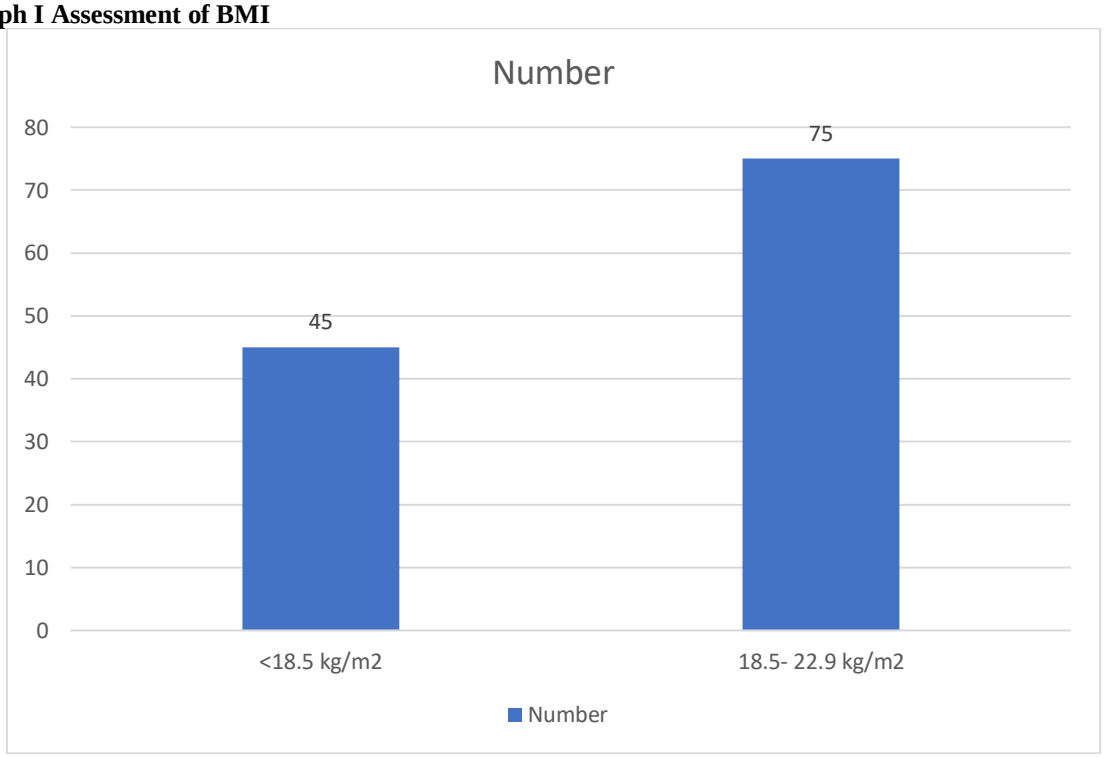

Table III Assessment of parameters

Parameters	Mean	SD
FBS(mg/dl)	83.6	5.1
FPI(µU/mL)	12.7	3.4
IR(HOMA)	2.5	.91
BMI(kg/m2)	19.1	1.5
SBP(mm Hg)	105.4	10.2
DBP(mm Hg)	73.6	6.5

Table III shows that mean FBS was 83.6mg/dl, IR was 2.5, BMI was 19.1 kg/m2, SBP was 105.4 mm Hg and DBP was 73.6 mm Hg.

Table IV Correlation of HOMA – IR with other factors

Parameters	R value	P value
Age	0.43	0.04
BMI	0.51	0.02
SBP	0.28	0.01
DBP	0.34	0.01

Table IV shows that there was positive correlation of HOMA – IR with age, BMI, SBP and DBP (P< 0.05).

DISCUSSION

Insulin resistance in muscle and adipose tissue results in an increase in plasma insulin and free fatty acid concentration.[7] These changes act on the liver to increase triglyceride synthesis and secretion, thereby initiating a series of metabolic events that result in a highly atherogenic lipoprotein profile: high triglyceride levels and low levels of high- density lipoprotein cholesterol; small, dense, low density lipoprotein particles; and accumulation of post prandial remnant lipoproteins.[8] These changes are each known to contribute to an increased risk of coronary artery disease. Insulin resistance is strongly related to several classic cardiovascular risk factors like hyperglycemia, obesity, hypertension and microalbuminuria.[9,10]The present study was conducted to assess HOMA – IR in apparently normal subjects.

We found that out of 120 patients, males were 65 and females were 55.In the Bruneck study, it was found that the subjects who are in the upper quartile of HOMA – IR had higher levels of circulating endothelial adhesion molecules.These adhesion molecules are markers of endothelial dysfunction and existing atherosclerosis. They also had higher levels of free fatty acids, uric acid, fibrinogen, CRP, leptin and oxidized LDL and lower levels of adiponectin, all these factors being predictors of clinical cardiovascular events.[11]

We found that <18.5 kg/m^2 was seen among 45 and 18.5- 22.9 kg/m^2 was seen in 75 patients. Singh et al[12]investigated IR by HOMA-IR in urban Indian adolescents and to establish cut-off values of HOMA-IR for defining MS.A total of 691 apparently healthy adolescents (295 with normal body mass index (BMI), 205 overweight, and 199 obese) were included. The mean height, waist circumference (WC), waist/hip ratio (WHR), waist/height ratio (WHtR), and blood pressure were significantly higher in boys as compared to girls. The HOMA-IR values increased progressively from normal weight to obese adolescents in both sexes. Mean HOMA-IR values increased progressively according to sexual maturity rating in both sexes. HOMA-IR value of 2.5 had a sensitivity of >70% and specificity of >60% for MS. This cut-off identified larger number of adolescents with MS in different BMI categories (19.7% in normal weight, 51.7% in overweight, and 77.0% in obese subjects) as compared to the use of IDF or ATP III criteria for diagnosing MS. Odds ratio for having IR (HOMA-IR of >2.5) was highest with WHtR (4.9, p <0.0001) and WC (4.8, p <0.0001), compared to WHR (3.3, p <0.0001).

We found that mean FBS was 83.6mg/dl, IR was 2.5, BMI was 19.1 kg/m2, SBP was 105.4 mm Hg and DBP was 73.6 mm Hg. There was positive correlation of HOMA – IR with age, BMI, SBP and DBP (P< 0.05). The Early Bird Diabetes study from UK had prospectively evaluated HOMA-IR in healthy children aged 5-14 years and found IR to start rising from mid-childhood (~ 7 years), a few years before puberty. The present study comprising adolescents between 10-17 years, being cross-sectional in design, may have missed an early rise of IR, which may have stabilized after pre-pubertal years. Also, lack of a correlation of HOMA-IR with age may possibly be related to the heterogeneity of pubertal status in the same chronological age groups, especially among girls.[13]

The limitation of the study is the small sample size.

CONCLUSION

Authors found that Indians have a higher mean HOMA-IR than other populations. The risk factors for coronary artery disease are directly correlated with HOMA-IR. Numerous cases of type 2 diabetes mellitus and coronary artery disease can be avoided by early diagnosis of those with significant insulin resistance.

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