(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

Assessment of HOMA – IR in healthy subjects

Devadatta Desai

Assistant Professor, Department of General Medicine, NRI Medical College & General Hospital, Guntur, Andhra Pradesh, India

ABSTRACT:

Background: Over the past 20 years, the prevalence of diabetes has increased significantly, from an estimated 30 million cases in 1985 to 285 million cases in 2010. The present study evaluated HOMA – IR in healthy subjects. **Materials & Methods:** 134 healthy subjects of both genders were selected. Assessment of blood pressure, weight and height and BMI were done. 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 134 subjects, males were 70 and females were 64. BMI was <18.5 kg/m^2 in 52 and 18.5- 22.9 kg/m^2 in 82 subjects. The difference was significant (P< 0.05). The mean FBS was 81.6 mg/dl, FPI was µU/mL, IR was 2.2, BMI was 19.4 kg/m2, SBP was 102.2 mm Hg and DBP was 75.4 mm Hg. There was positive correlation of HOMA – IR with age, BMI, SBP and DBP (P< 0.05). **Conclusion:** The mean HOMA-IR of Indians is higher than that of other populations. There exists a direct correlation between HOMA-IR and the risk factors for coronary artery disease. Early detection of severe insulin resistance can prevent many cases of type 2 diabetes mellitus and coronary artery disease.

Keywords: Diabetes, exercise, Insulin

Corresponding author: Devadatta Desai, Assistant Professor, Department of General Medicine, NRI Medical College & General Hospital, Guntur, Andhra Pradesh, India

This article may be cited as: Desai D. Assessment of HOMA – IR in healthy subjects. J Adv Med Dent Scie Res 2015;3(3):216-219.

INTRODUCTION

Over the past 20 years, the prevalence of diabetes has increased significantly, from an estimated 30 million cases in 1985 to 285 million cases in 2010. According to the International Diabetes Federation, 438 million people worldwide will have diabetes by 2030.[1] Type 2 diabetes is expanding more quickly than type 1 diabetes, despite the fact that both types are becoming more common globally. This is likely due to factors such as increased obesity, declining levels of physical exercise as nations become more industrialized, and an aging population.[2]

Insulin resistance and aberrant insulin secretion are the two main factors that lead to type 2 diabetes development. The majority of research back with the theory that insulin resistance comes before an insulin secretary deficiency, despite disagreements regarding the fundamental defect.3. Heart disease is another non-communicable illness pandemic that is sweeping the globe. CAD is the leading cause of death for both men and women, and it has a massive financial impact on every nation. According to WHO predictions, there would be 11.1 million CAD deaths worldwide by 2020, up from 7.1 million in 2002.[3,4]

Insulin resistance can be measured more conveniently with HOMA-IR. It is computed by multiplying the fasting plasma glucose (in mg/dl) by the fasting plasma insulin (in micro units/ml), and then dividing the result by the constant 4056.[5] A uniform reference range for HOMA-IR across various populations has been the subject of numerous investigations. However, the lack of a consistent reference range for HOMA-IR in the Indian population has restricted the use of the test in clinical and population settings.[6] The present study evaluated HOMA – IR in healthy subjects.

MATERIALS & METHODS

The present study comprised of 134 healthy subjects of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Information was gathered about parameters including smoking, chewing tobacco, drinking alcohol, having a family history of diabetes mellitus, hypertension, coronary artery disease, and systemic steroids. We measured blood pressure, weight, and height. The formula used to compute BMI was BMI = weight in kgs/(height in meters).Two blood samples were taken following an overnight fast of twelve hours. This blood sugar was measured using the oxidase-peroxidase technique during fasting. The cholesterol oxidase-peroxidase technique was used to assess total cholesterol. The glycerol phospho oxidase-peroxidase method was used to measure the amounts of triglycerides. The direct enzymatic colorimetric test was used to determine the levels of HDL and LDL cholesterol. The electrochemiluminescence test was used to determine the insulin in fasting plasma. HOMA-IR was computed using the following formula: HOMA-IR = fasting insulin (µU/mL) X glucose (mg/dl)/405. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Total- 134		
Gender	**Male**	**Female**
Number	70	64

Table I shows that out of 134 subjects, males were 70 and females were 64.

Table II Assessment of BMI

BMI	Number	P value
<18.5 kg/m^2	52	0.04
18.5- 22.9 kg/m^2	82	

Table II show that BMI was <18.5 kg/m^2 in 52 and 18.5- 22.9 kg/m^2 in 82 subjects. The difference was significant (P< 0.05).

Table III Assessment of parameters

Parameters	Mean	SD
FBS (mg/dl)	81.6	5.8
FPI (µU/mL)	13.7	3.5
IR (HOMA)	2.2	0.92
BMI (kg/m2)	19.4	1.4
SBP (mm Hg)	102.2	10.1
DBP (mm Hg)	75.4	6.2

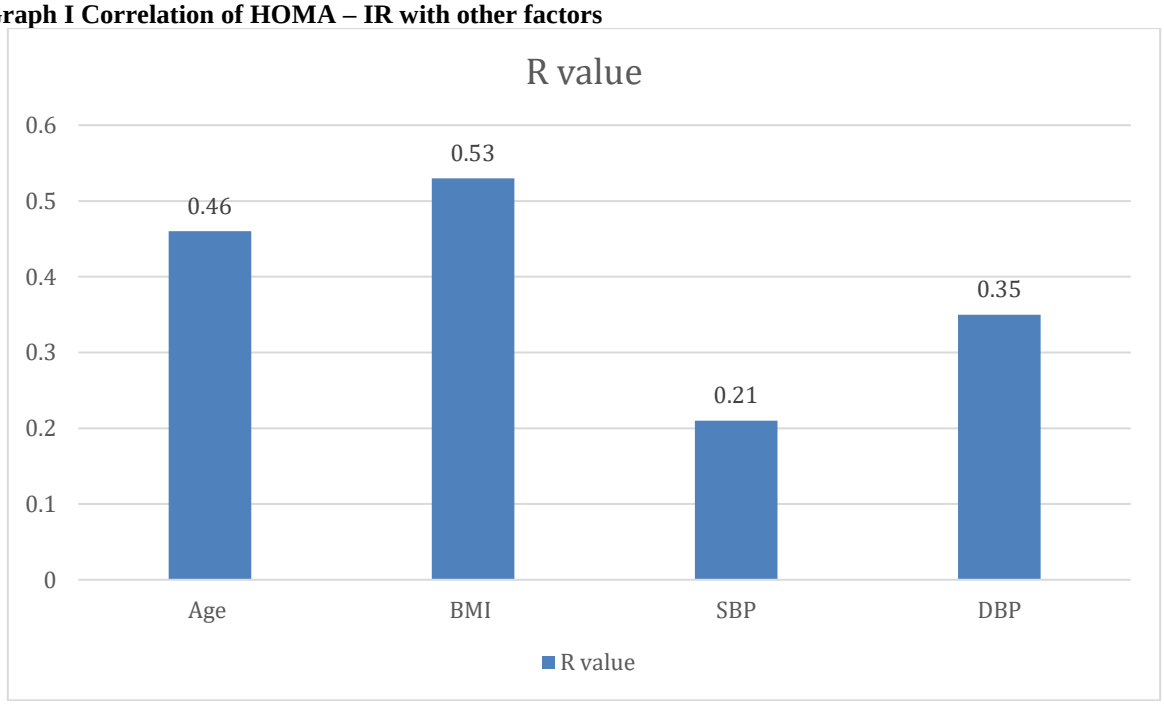
Table III shows that mean FBS was 81.6 mg/dl, FPI was µU/mL, IR was 2.2, BMI was 19.4 kg/m2, SBP was 102.2 mm Hg and DBP was 75.4 mm Hg.

Table IV Correlation of HOMA – IR with other factors

Parameters	R value	P value
Age	0.46	0.05
BMI	0.53	0.03
SBP	0.21	0.02
DBP	0.35	0.04

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

Graph I Correlation of HOMA – IR with other factors



DISCUSSION

Plasma insulin and free fatty acid concentration rise in muscle and adipose tissue due to insulin resistance.[7] A highly atherogenic lipoprotein profile is produced by these alterations, which act on the liver to increase triglyceride synthesis and secretion.[8,9] This leads to a sequence of metabolic events, including small, dense, low density lipoprotein particles, accumulation of post prandial remnant lipoproteins, and high triglyceride levels and low levels of high-density lipoprotein cholesterol.[10] It is established that each of these alterations raises the risk of coronary artery disease. Numerous traditional cardiovascular risk factors, including hyperglycemia, obesity, hypertension, and microalbuminuria, are closely correlated with insulin resistance.[11,12] The present study evaluated HOMA – IR in healthy subjects.

We found that out of 134 subjects, males were 70 and females were 64. BMI was <18.5 kg/m^2 in 52 and 18.5- 22.9 kg/m^2 in 82 subjects. Geloneze B et al[13] investigated cut-off values for HOMA1-IR and HOMA2-IR to identify insulin resistance (IR) and metabolic syndrome (MS), and to assess the association of the indexes with components of the MS. Nondiabetic subjects from the Brazilian Metabolic Syndrome Study were studied (n = 1,203, 18 to 78 years). The cut-off values for IR were determined from the 90th percentile in the healthy group (n = 297) and, for MS, a ROC curve was generated for the total sample. In the healthy group, HOMA-IR indexes were associated with central obesity, triglycerides and total cholesterol ($p < 0.001$). The cut-off values for IR were: HOMA1-IR > 2.7 and HOMA2-IR > 1.8; and, for MS were: HOMA1-IR > 2.3 (sensitivity: 76.8%; specificity: 66.7%) and HOMA2-IR > 1.4 (sensitivity: 79.2%; specificity: 61.2%).

We observed that the mean FBS was 81.6 mg/dl, FPI was µU/mL, IR was 2.2, BMI was 19.4 kg/m2, SBP was 102.2 mm Hg and DBP was 75.4 mm Hg. There was positive correlation of HOMA – IR with age, BMI, SBP and DBP ($P< 0.05$). Puneeth et al[14] determined whether SUA levels can be used as a surrogate for insulin resistance calculated as homeostatic model assessment insulin resistance (HOMA-IR) in apparently healthy, normal weight, overweight, and obese population. A cross-sectional study done in 150 subjects of both genders aged 20-40 years was divided equally based on their body mass index into three groups namely normal weight, overweight, and obese as per National Institutes of Health classification. Fasting plasma glucose, fasting serum insulin, and SUA were estimated. HOMA-IR was calculated. The mean waist circumference, waist-hip ratio, fasting insulin, fasting glucose, uric acid, and HOMA-IR were found to be elevated in both overweight and obese groups. Mean uric acid levels were 4.9 mg/dL, 5.4 mg/dL, and 6.3 mg/dL and mean HOMA-IR values are 2.2, 3.3, and 7.3, respectively, in normal weight, overweight, and obese subjects. Significant correlation of uric acid with insulin resistance calculated as HOMA-IR was not found in any of the three groups.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that the mean HOMA-IR of Indians is higher than that of other populations. There exists a direct correlation between HOMA-IR and the risk factors for coronary artery disease. Early detection of severe insulin resistance can prevent many cases of type 2 diabetes mellitus and coronary artery disease.

REFERENCES

1. Weyer C, Funahashi T, Tanaka S, Hotta K, Matsuzawa Y, Pratley RE, et al. Hypoadiponectinemia in obesity and type 2 diabetes: close association with insulin resistance and hyperinsulinemia. J Clin Endocrinol Metab 2001;86:1930-5.
2. Wannamethee SG, Lowe GDO, Shaper AG, Rumley A, Lennon L, Whincup PH. Insulin resistance, hemostatic and inflammatory markers and coronary heart disease risk factors in type 2 diabetic men with and without coronary heart disease. Diabetologia 2004;47:1557-65.
3. Ziccardi P, Nappo F, Giugliano G, Esposito K, Marfella R, Cioffi M, et al. Reduction of inflammatory cytokine concentration and improvement of endothelial functions in obese women after weight loss for one year. Circulation 2002;105:804-9.
4. Nagi DK, Yudkin JS. Effects of metformin on insulin resistance, risk factors for cardiovascular disease, and plasminogen activator inhibitor in NIDDM subjects. A study of two ethnic groups. Diabetes Care 1993; 16:621-9.
5. UK Prospective Diabetes Study (UKPDS) Group: Effect of intensive blood glucose control with metformin on complications in overweight patients with type 2 diabetes. (UKPDS 34). Lancet 1998;352:854-65.
6. Hak AE, Pols HA, Stehouwer CD, Mejer J, Kiliaan AJ, Hofman A, et al. Markers of inflammation and cellular adhesion molecules in relation to insulin resistance in nondiabetic elderly: the Rotterdam Study. J Clin Endocrinol Metab 2001;86:4398-405.
7. Toft I, Bonaa KA, Ingebretsen OC, Nordoy A, Birkeland KI, Jenssen T. Gender differences in the relationships between plasma plasminogen activator inhibitor-1 activity and factors linked to the insulin resistance syndrome in essential hypertension. Arterioscler Thromb Vasc Biol 1997;17:553-9.
8. Carantoni M, Abbasi F, Warmerdam F, Klebanov M, Wang PW, Chen YD, et al. Relationship between insulin resistance and partially oxidized LDL particles in healthy, nondiabetic volunteers. Arterioscler Thromb Vasc Biol 1998;18:762-7.
9. Langenfeld MR, Forst T, Hohberg C, Kann P, Lubben G, Konrad T, et al. Pioglitazone decreases carotid intima-media thickness independently of glycemic control in patients with type 2 diabetes mellitus: results from a controlled randomized study. Circulation 2005; 111:2525-31.
10. Bonora E, Kiechl S, Willeit J, Oberhollenzer F, Egger G, Bonadonna R, et al. The Metabolic Syndrome: epidemiology and more extensive phenotypic

description. Cross-sectional data from the Bruneck Study. Int J Obes 2003;27:1283-89.
11. Singh Y, Garg MK, Tandon N, Marwaha RK. A study of insulin resistance by HOMA-IR and its cut-off value to identify metabolic syndrome in urban Indian adolescents. Journal of clinical research in pediatric endocrinology. 2013 Jan 1;5(4):245-51.
12. Jeffery AN, Metcalf BS, Hosking J, Streeter AJ, Voss LD, Wilkin TJ. Age before stage: insulin resistance rises before the onset of puberty: A 9-years longitudinal study (EarlyBird 26) Diabetes Care. 2012;35:536–541.
13. Geloneze B, Vasques AC, Stabe CF, Pareja JC, Rosado LE, Queiroz EC, Tambascia MA. HOMA1-IR and HOMA2-IR indexes in identifying insulin resistance and metabolic syndrome: Brazilian Metabolic Syndrome Study (BRAMS). Arquivos Brasileiros de Endocrinologia & Metabologia. 2009;53:281-7.
14. Puneeth A, Manjrekar PA, Hegde A, Rukmini M S, Rajan MG, Shenoy MT. Are uric acid values surrogate for insulin resistance in apparently healthy subjects across a spectrum of body mass index?. Int J Health Allied Sci 2015;4:141-7