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Early predictors of incipient metabolic syndrome in an Arab population

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Background: Metabolic syndrome is defined by a constellation of abnormal metabolic factors that directly increase the risk for type-2 diabetes and cardiovascular disorders. In the Gulf Cooperation Council region the prevalence of metabolic syndrome in the population is higher than in most developed countries, with generally greater rates for women, often higher than 40%. Thus, early clinical identification of patients is important to adequately implement treatments to reduce their risk of subsequent metabolic disease.

Aims: The aims of this study were to investigate the hypothesis that in sedentary subjects, post-prandial hyperinsulinemia, despite normal levels of glucose, is an indicator of incipient diabetes. Further this lesion is associated with markers of adipose and hepatic dysfunction.

Methods: Forty-two (42) apparently clinically healthy residents of Qatar were studied. After a 10-hour overnight fast, subjects underwent a detailed clinical assessment, including body composition by bioimpedance, anthropometry measurements (height, weight and BMI), and blood pressure. A liquid mixed meal was administered (200 ml of 18 g proteins, 17.4 g fats and 40 g carbohydrates: Total energetic value of 400 kcal) and blood sampling carried out prior to and 30 and 120 minutes after the meal. The study was approved by the Institutional Research Ethics Committee and all subjects provided written informed consent prior to participation. Fasting serum levels of lipids (high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol, and triglycerides), and liver function markers [gamma-glutamyltransferase (GGT), Alkaline phosphatase (ALP), Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), total bilirubin(TB), direct bilirubin (DB), albumin (ALB)]. Plasma glucose, insulin and proinsulin were also determined. HOMA-IR (homeostasis model of assessment-insulin resistance) was calculated using the following formula: (fasting insulin in mIU/L * fasting glucose in mmol/L)/22.5. Serum levels of leptin and adiponectin were measured using human 2-site ELISAs. All inter- and intra-assay CVs were less than 10%.

Results: There were no differences in age, blood pressure and body composition between the two groups. However, 48% of this population showed hyperinsulinemia in the fasting state, as well as relative hyperglycemia, hyperinsulinemia and hyperproinsulinemia 2 hour after the meal challenge. Systemic lipids and markers of liver function were comparable between the groups, while leptin was elevated in the hyperinsulinemia group (26.1 ng/ml versus 20.9 ng/ml), this did not reach significance. However adiponectin was significantly lower in this cohort (5.8 mcg/ml versus 8.5 mcg/ml, P=0.002). Significant correlations were apparent between fasting insulin concentration and height, measures of body fat as well as muscle mass. In addition fasting insulin also correlated significant with SBP, as well as all measures of glucose and HOMA-IR. Interestingly fasting insulin also correlated positively and significantly with liver enzymes. Inverse, but significant, association was found between insulin with HDL-C and adiponectin. Most of these relationships were lost in the postprandial state.

Conclusion: Thus, these data indicate that post prandial hyperinsulinemia and decreased adiponectin levels should be considered in the plethora of the altered biochemical parameters that define the metabolic syndrome. More importantly, since these biochemical alterations occur in seemingly healthy residents, they may well be considered early biomarkers of incipient metabolic syndrome. The reasons for this lesion in a young and healthy population are likely to be the consequence of a sedentary lifestyle. Exercise and training can improve both insulin resistance and increase adiponectin and should be actively advocated for this population.

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