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Research Article

Relation of Circulating Adiponectin Level with Epicardial Adipose Tissue Thickness Among Overweight and Obese Indian Patients: A Cross Sectional Study

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Abstract

Background: Obesity is associated with various cardiometabolic disorders. Recent studies have explored that ectopic fat is pathologically more ominous than Eutopic fat. Excess Epicardial Adipose tissue (EAT) is considered as ectopic fat which is defined as deposition of triglycerides within cells of non-adipose tissue that normally contain only small amounts of fat. Epicardial adipose tissue (EAT) which is now considered as endocrine organ, is a potential source of bioactive molecules. Bioactive molecules thus synthesised and secreted are responsible for adverse consequences over myocardium by autocrine and paracrine loop. Circulating Adiponectin has an anti-inflammatory and anti-obesogenic property. Adiponectin reduces as obesity and insulin resistance increases. The purpose of this study was [1] to assess the circulating Adiponectin level among obese and overweight patients and [2] to assess possible relation between Adiponectin level and EAT.

Methods: It was a cross-sectional observational study involving adults more than 18 years (n = 74) present with overweight (BMI ≥ 23 Kg/M2) and obesity (BMI ≥ 25 Kg/M2) in Obesity and lifestyle diseases clinic of IPGME and R, Kolkata. Acutely ill patients, pregnant patients, advanced hepatic and renal disease patients and patient having history of acute coronary syndrome were excluded from the study. EAT assessment was done by trans thoracic echocardiography, Adiponectin assessment was done by Adipogen mouse kit (ACRP 30; Adipo Q).

Results: Mean Adiponectin value was 0.71 ng/ml (SD 0.70) among the study group. Mean epicardial Adipose tissue thickness was 6.11 mm (SD 1.830). There was a strong negative correlation exists between Adiponectin level and EAT (R: -0.5696; $p < 0.05$). Adiponectin was inversely correlated with EAT in this study, as EAT increases level of circulating adiponectin reduces. Among the traditional anthropometric variables only Waist Hip ration and Percent body fat was significantly correlated with EAT.

Conclusion: Adiponectin is an anti-obesogenic molecule secreted from Adipose tissue and regulate body fat deposition and inflammation. A strong inverse correlation has been shown between circulating Adiponectin level and EAT in this study. Low adiponectin is detrimental as per ectopic adiposity in the form of EAT is concern.

Keywords: Adiponectin; Epicardial Adipose Tissue; Obesity

Introduction

Adiponectin, an adipocytokine specifically secreted from adipocytes, it has anti-inflammatory, and antiatherogenic properties and it increases insulin sensitivity [1].

Plasma adiponectin level is also inversely associated with metabolic syndrome [2,3] and a cluster of obesity-related disorders, including visceral obesity, insulin resistance, dyslipidaemia, and hypertension [4].

It has been shown that high plasma adiponectin prevents metabolic syndrome [5] and low adiponectin levels is associated with an increased risk of obesity especially visceral obesity and metabolic syndrome [6].

Adiponectin secreted from adipose tissue in high concentrations (3–30 mg/L) [7].

Accumulation of fat at ectopic sites can explain almost all metabolic consequences of obesity. Certain characteristics of adipocytes like increased size and ectopic accumulation make them metabolically sick. Ectopic fat mainly consistent of intrahepatic, pancreatic, intramyocellular, epicardial and within vascular smooth muscle [8].

Epicardial fat now emerges as a new potential threat to metabolic debacle. Albeit its physiological and pathological roles are not completely understood, a body of evidence indicates that epicardial adipose tissue is a fat depot with some unique properties [9]. Epicardial fat, which is now considered as endocrine organ, is a potential source of bioactive molecules. Bioactive molecules thus synthesised and secreted are responsible for adverse consequences over myocardium by autocrine and paracrine loop [9].

Indian patients often designated as Indian phenotype are unique in terms of Metabolic health. They have excess visceral fat, low HDLC, high TG and low muscle mass, higher insulin resistance and metabolically unhealthy [10-17].

The purpose of this study was [1] to assess the circulating Adiponectin level among obese and overweight Indian patients and [2] to assess possible relation between Adiponectin level and EAT among Indian patients.

Methods

It was a cross-sectional observational study based on Hospital.

Study population

The study participants were 74 obese or overweight individuals with age range of 18 years to 65 years. They were recruited by absolute enumeration based on unique patient ID during study period viz. September 2018 to January 2019. Overweight and obesity was determined by BMI ≥ 23 Kg/M^2 and BMI ≥ 25 Kg/M^2 respectively. Acutely ill patients, pregnant patients, advanced hepatic and renal disease patients, hypothyroid patients and patient having history of acute coronary syndrome were excluded from the study. Previously diagnosed diabetic and dyslipidaemic patients on therapy were also excluded from the study.

Anthropometric measurements

Height, Weight, Body mass Index (BMI), Waist Circumference (WC), Waist Hip Ratio (WHR) was assessed. Body fat percentage (PBF) and visceral fat percentage (VFP) were analysed by Bio-electrical impedance technique by Omron HBF306.

Assessment of adiponectin

Adiponectin was measured from stored plasma collected at clinic during evaluation and assessed by a commercially available enzyme-linked immunoassay (ELISA) method. (Adipogen mouse kit; ACRP 30; Adipo Q). Range of detection 0.5 to 32ng/ml with sensitivity 100 pg/ml. The intra- and inter-assay coefficients of variation were < 4% and < 7%, respectively.

Assessment of epicardial adipose tissue thickness

Assessment of EAT was done by Echocardiography. Which was undertaken in our echocardiographic laboratory following standard methods. They included cross sectional, M mode. EAT was assessed by assessing the echo free space on the RV free wall perpendicular to the aortic annulus in diastole. Mean of three consecutive measurements was taken as final thickness.

Statistical analysis

Non-parametric tests were applied to this study as the distribution was non-normal. SPSS and Excel stat were used to analyse the data with alpha level set at 0.05.

Results

Mean age of the study population was 38.9 years with SD 9.817. Minimum age was 18 and maximum was 63 years. Minimum body weight of the study subjects was 59 kgs, maximum was 104 kgs, with mean body weight 79.284 (SD: 9.081). Minimum BMI was 25 kg/m2 and Maximum 42.8 kg/m2, with mean 32.428 kg/m2 (SD: 3.440).

Mean waist circumference of study subjects was 104.47 cm (SD: 7.110). Lower quartile 100 cm and upper quartile 109 cm. Mean percent body fat of study subjects was 38.13% (SD: 6.541).

Mean Adiponectin level was 0.71 (SD: 0.70). Mean EAT was 6.111 mm (SD 1.830). Upper quartile mean was 7 mm and lower quartile mean 5.030 mm.

Adiponectin level in ng/ml was inversely correlated with EAT with Spearman correlation coefficient (Two-sided CI): -0.5696 (-0.7152 to –0.3767 in 95% CI) T = 5.8806; P = 0.00001 (< 0.05).

Adiponectin was compared with WC, WHR, BMI, PBF as predictor of Excess EAT in a linear regression model. Model showed a strong negative correlation between Adiponectin and EAT after adjusting other anthropometrics parameters (Table -1).

Variables	Standardised coefficient in 95% CI	P value
Adiponectin	-0.4	0.0016 (<0.05)
WHR	0.16	0.0470 (<0.05)
WC	0.031	0.66 (>0.05)
BMI	0.034	0.60 (>0.05)
PBF	0.351	0.021(<0.05)

Table 1: Linear regression model comparing Anthropometric variables with adiponectin for predicting EAT.

Discussion

Adiponectin is an anti-obesogenic molecule secreted from Adipose tissue that regulate body fat deposition and inflammation. In this cross-sectional study which comprises 74 obese and overweight patients of Indian origin, strong inverse correlation has been demonstrated between circulating Adiponectin level and Epicardial adipose tissue thickness. We established Adiponectin as a better predictor of excess EAT with (Rho – 0.4; p < 0.05) as compared to anthropometric variables like WHR (Rho 0.16; p < 0.05), WC (Rho 0.0.31, p > 0.05), BMI (Rho 0.034; p > 0.05), PBF (Rho 0.351; p < 0.05). Although there is scarcity of studies directly addressed EAT and adiponectin in the literature, but our findings are consistent with those of a few published studies on the association of baseline adiponectin levels with metabolic syndrome.

A recent study by Kim., *et al.* [18] in obese adolescents in South Korea showed good correlation between the anthropometric parameters and echocardiographic ally determined epicardial fat thickness. However, similar data is lacking in the Asian-Indian population where no large studies have been conducted to validate these findings. Our study is somehow dissimilar to the findings by Kim., et al. our study showed a positive association between epicardial adipose tissue and WHR and PBF but not with WC and BMI.

The inverse relation of elevated adiponectin to EAT has also demonstrated in S.N. Psychari., et al. study which is like our findings [19].

We are in an era of non-traditional biomarkers of obesity. Adiponectin is one of such biomarkers. We have shifted our concept from Obesity to Adiposity to Adipocyte dysfunction. We know unhealthy adipocytes are the main culprit behind metabolic debacle and associated diseases. Developing new tools beyond WC, WHR to predict visceral adiposity and ectopic adiposity is the need of the hour. This present study is just a step towards developing that less explored window of non-traditional biomarkers as a tool for comprehensive obesity assessment.

Conclusion

Adiponectin is an anti-obesogenic molecule secreted from Adipose tissue and regulate body fat deposition and inflammation. A strong inverse correlation has been shown between circulating Adiponectin level and EAT in this study. Low adiponectin is detrimental as per ectopic adiposity in the form of EAT is concern.

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