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Original Research Article

A comparative study of serum adiponectin levels in patients of acute coronary syndrome with and without central obesity

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ABSTRACT

Background: Coronary artery disease burden has been on a rise globally with it emerging as the principle cause of death even in the Indian subcontinent. Serum adiponectin has recently gained interest due to its close relation with atherosclerotic CAD and Metabolic syndrome. The levels of serum adiponectin are reduced in ACS. There is a paucity of studies in South Indian population comparing the effect of central obesity in patient with ACS. The aim of the present endeavour was to study the association of serum adiponectin in risk evaluation of patient with acute coronary syndrome with and without central obesity

Methods: The study was conducted in a tertiary center in patient who presented with first time ACS they were grouped into two groups based on the presence and absence of central obesity. Central obesity was defined on the basis of waist to hip ratio. Serum adiponectin levels were estimated in both the groups using ELISA method. The results were statistically analyzed using t- test.

Results: Authors concluded that the mean age of patients presenting first time with ACS was 55±12years in both the group. There was a significantly raised LDL and Total Cholesterol (TC) level in patient with central obesity.

The estimated serum adiponectin level was reduced in both the group with more significant reduction in group with central obesity. The mean adiponectin level in CAD patients with central obesity was 2.326±1.437µg/ml as compared to 3.486±1.6999µg/ml in patients without central obesity, which was statistically significant (p value <0.0049).

Conclusions: Authors concluded that serum adiponectin levels were reduced in both the group with ACS with a further reduction in patient with central obesity. It was also observed that there was a significant relation between adiponectin level and visceral fat as compared to superficial fat, as adiponectin was significantly reduced in patient higher waist-hip ratio.

Keywords: Adiponectin, Acute coronary syndrome, Metabolic syndrome

INTRODUCTION

Amongst non-communicable diseases, the coronary artery disease has become a pandemic. Though earlier it was limited to developed countries, now its seen rising in developing countries competing with communicable diseases. The Prevalence of CAD is on a rise in the south Asian subcontinent with India being hub for it. Cardiovascular disease burden has increased since the beginning of the era of industrialization. CVD accounts

for 30% all-cause mortality globally. It is predicted that the India will have the highest burden of CVD by 2020.[1] CVD has become one of the leading causes of mortality even in developing countries. The WHO PREMISE study has stated that the prevalence of CHD was maximum in Indian adult of less than 50 years of age.[2] Similarly in the Million Death study, CHD is labeled as the highest cause of mortality in young adults.[3] The prevalence of CAD was found to be high in urban population as compared to rural.

Metabolic syndrome is considered as a major risk factor for CAD. The parameters included in defining metabolic syndrome are central obesity, glucose intolerance, hypertension and insulin resistance. The prevalence of metabolic syndrome has followed an increasing trend with advent of sedentary life style. Trial conducted in south Indian population have shown rising incidence of metabolic syndrome in the elderly urban population.[4] The metabolic syndrome prevalence predisposes to increase in cardiovascular risk irrespective of age, gender, family history and diabetes.

Adipose tissue is no longer considered as an inhert storage tissue in fact as an active endocrine tissue. The adipose tissue secretes cytokines which play an important role in mediating chronic inflammatory state seen in atherosclerosis and coronary artery disease. The cytokine secreted include interleukin-6, tumor necrosis factor-α and adiponectin.

Serum adiponectin is a novel adipokine secreted by adipose tissue. It is a recent biomarker used in evaluation of obesity and metabolic syndrome. It is a 30 kDa adipocyte complement related protein which has anti-inflammatory, anti-thrombotic and anti-atherogenic property.[5] The level of serum adiponectin is found to be reduced in obesity, metabolic syndrome and coronary artery disease.[6] Hypoadiponectinemia is associated with endothelial dysfunction and dyslipidemia. It has also been related to plaque instability and severity of CAD.[7] Trial done earlier have found direct association between serum adiponectin level and CAD. Whether there exist a direct effect of adiponectin or via other cytokines secreted by adipose tissue remains unexplained.

The role of adiponectin as risk factor for cardiovascular disease remains unexplained. The current literature states about a reduction in serum adiponectin levels in metabolic syndrome and cardiovascular disease which include western population. Hence it will be worthwhile to evaluate serum adiponectin level in Indian population. The studies done before compared coronary artery disease patient with normal individual. There also exists a lack of knowledge when the same variable is compared amongst acute coronary syndrome patients.

Taking the the mentioned points into consideration like hypoadiponectinemia, coronary artery disease and central obesity the present study was planned for risk evaluation and to see the association of serum adiponectin level in patient presenting with acute coronary syndrome with and without central obesity.

METHODS

The study was conducted in Mahatma Gandhi Medical College, Puducherry, a tertiary health care center with an annual volume of over 1,00,000 patients. The study was a prospective comparative study which was approved by the Institutional Human ethical committee for the year 2015-16. The study included 100 patients who presented to MGMCRI for the first time with acute coronary syndrome. Informed consent was taken from the patient before their participation in the study.

Exclusion criteria

- Patients who had a history of MI/ACS,
- Coronary artery bypass grafting,
- Percutaneous transluminal coronary angioplasty,
- Overt congestive heart failure,
- Cardiomyopathies,
- Advanced heart failure,
- Hypothyroidism and hepatic dysfunction.

The diagnosis of ACS was made considering ECG changes with positivity of cardiac enzyme. The patient in both groups underwent routine investigation like complete blood count, renal function test, fasting lipid profile, random blood sugar and serum electrolytes.

Patients were divided in to two group on the basis of presence of central obesity. Group A had patient without central obesity and Group B with central obesity. The obesity was defined by BMI and central obesity by waist hip ratio. The cut off for waist to hip ratio according to WHO criteria for males was >0.9 and for females >0.85.

Serum samples from the patients were collected and preserved in deep freeze. All the samples were processed at one single time. The serum adiponectin levels were estimated using ELISA Method. The sample for serum adiponectin was processed using ASSAY PRO Human adiponectin ELISA Kit (USA).

Statistical analysis

The SPSS, version 19 software tool was used for the data processing. All the values were expressed as mean±standard deviation unless otherwise indicated. The differences in the mean values between the groups were analyzed by using the Student's t-test. A p value of <0.05 was considered statistically significant.

RESULTS

The mean age in group 1 (55.2years) was not different from the mean age of controls in group 2 (56 years). The

mean height and waist circumference were not significantly different in both the study groups. But the BMI in group 2 (26.6 kg/m^2) was significantly higher (p <0.0001) than BMI of group 1 subjects (21.7 kg/m^2). Also, it was revealed that the mean weight and hip circumference was significantly different in both groups (p value for weight <0.0001 and p value for hip circumference = 0.0224) (Table 1).

The mean value of triglycerides, HDL and VLDL was not significantly different in both the study groups. But total cholesterol in group 2 (168.1mg/dL) was significantly higher (p=0.035) than total cholesterol in group 1 subjects (156.3mg/dL) (p=0.39). Similarly, LDL in group 2 (106.92mg/dL) was significantly higher (p=0.0192) than LDL in group 1 subjects (94.58mg/dL) (p=0.192).

The mean serum adiponectin level was found to be 3.486µg/ml in group 1 as compared to 2.326µg/ml in Group 2, which was found to be statistically significant (p=0.001). the serum adiponectin level was decreased in both the groups, but the levels were suppressed to a greater extent in those with central obesity when compared to those without.

Table 1: Mean values of various clinical and laboratory parameters.

Variables	Group 1	Group 2	't' Value	'p' Value
	Mean±SD	Mean±SD		
Mean age (years)	55.22±12.75	56 ±12.34	0.28	0.3901 (NS)
Waist to hip ratio	0.8754±0.0466	1.1526±0.264	7.7024	<0.0001 (S)
Height (cms)	164.4±8.415	165.74±8.178	0.7646	0.224 (NS)
Weight (kgs)	59.36±8.677	72.26±11.25	7.0674	<0.0001 (S)
BMI	21.763±1.442	26.647±3.747	8.8252	<0.0001 (S)
Total cholesterol (mg/dL)	156.3±20.963	168.1±38.249	1.7928	0.0395 (S)
Triglycerides (mg/dL)	129.3±49.5655	130.52±43.524	0.1328	0.4474 (NS)
HDL (mg/dL)	40.36±17.727	41.36±11.9808	0.3052	0.3807 (NS)
LDL (mg/dL)	94.58±22.616	106.92±34.571	2.1259	0.0192 (S)
VLDL (mg/dL)	34.3±12.678	31.02±15.273	1.1471	0.128 (NS)
Adiponectin (µg/ml)	3.486±1.6999	2.326±1.437	3.5016	0.00049 (S)

DISCUSSION

In present study, the mean age of our study group with ACS and central obesity was 56±12.34years as compared to 55.22±12.75years among patients with ACS without central obesity which did not vary significantly. Mittal et al, in their study found the mean age of 55.58±12.10years among ACS patients as compared to 57.49±10.44years among those without ACS.[7] The patients with ACS in both the groups were predominantly males contributing to 77% of the total study population of which 82% were found in ACS without central obesity and 72% in ACS with central obesity. A similar observation was witnessed by Mittal et al, in which 77.8% of males had ACS, but in this study the comparison was made with age and sex matched controls.[7] No previously published articles have compared patients with ACS in the presence and absence of central obesity.

In current study, the mean height of patients with ACS and central obesity was 165.74±8.178 cms as compared to 164.4±8.415 cms among ACS patients without central obesity which was not statistically significant (p=0.224). In a study done by Jain et al, the mean height between those with ACS and obesity was 164.1±6.9 cms as compared to 164.3±8.8cms among control group which did not vary significantly (p=0.890).[8]

In present study, the mean weight of patients with ACS and central obesity was 72.26±11.25kgs as compared to 59.36±8.677kgs among ACS patients without central obesity which was found to be statistically significant (p <0.001). Jain et al, on comparing obese patients with ACS and healthy controls found that the mean weight was 65.2±11.6kgs in the obese group as compared to 60.6±11.7kgs among healthy controls, which was not found to be statistically significant (p=0.55).[8]

In present study, the mean BMI of patients with ACS and central obesity was 26.64±3.74 as compared to 21.763±1.44 among ACS without central obesity, which was found to be statistically significant (p <0.001). Jain et al, on comparing obese patients with ACS and healthy controls found that the mean BMI was 24.2±3.8 in the obese group as compared to 22.4±3.6 among healthy controls, which was found to be statistically significant (p=0.014).[8] Mittal et al, on comparing patients with and without ACS, observed BMI of 26.71±4.09 among the ACS group and 23.82±3.5 among the non ACS group

which was found to be statistically significant (p <0.001).[8]

In present study, the mean waist to hip ratio of patients with ACS and central obesity was 1.15±0.264 as compared to 0.87±0.04 among ACS patients without central obesity, which was found to be statistically significant (p <0.001). There are no previously published data on ACS where a comparison of BMI with Waist to hip ratio has been made, except in metabolic syndrome. In this study, out of 50 patients with ACS who were categorized to have central obesity based on waist to hip ratio, only 28 patients (56%) were in the category of obesity based on BMI. Since the prevalence of abdominal obesity is much higher in Indian population, waist to hip ratio will be a reliable predictor of obesity than BMI.

In present study, the mean total cholesterol (TC) of patients with ACS and central obesity was 168.1±38.24mg/dl as compared to 156.3±20.96mg/dl among ACS patients without central obesity, which was found to be statistically significant (p=0.03). Jain et al, on comparing obese ACS patients with healthy controls found that the mean TC was 173.0±52.3mg/dl in the obese group as compared to 150.8±39.3mg/dl, which was found to be statistically significant (p=0.019).[8]

In present study, the LDL of patients with ACS and central obesity was 106.92±34.57mg/dl as compared to 94.58±22.6mg/dl among ACS patients without central obesity, which was found to be statistically significant (p=0.019). Jain et al, found a mean LDL level of 107.2±47.3 mg/dl as compared to 95.5±27.6mg/dl among healthy controls, which was not found to be statistically significant (p=0.132).[8] Similarly, Mittal et al, found a mean LDL level of 83.91±37.6mg/dl in ACS group as compared to 75.20±32.41mg/dl in non-ACS group, which was not found to be statistically significant (p=0.242).[7]

In present study, the mean triglycerides (TG), HDL, VLDL of patients with ACS and central obesity was 130.5±43.52mg/dl, 41.36±11.98mg/dl and 31.02±15.27mg/dl as compared to 129.3±49.5 mg/dl, 40.36±17.2mg/dl and 34.3±12.6mg/dl among ACS patients without central obesity respectively, which was not found to be statistically significant (p=0.44, p=0.38, p=0.12). Jain et al, observed a mean TG and HDL level of 129.9±60.3mg/dl and 35.6±8.1mg/dl among obese ACS patients as compared to 117.3±57.8mg/dl and 36.6±8.7mg/dl among healthy controls respectively, which was not found to be statistically significant (p=0.286, p=0.562).[8] Mittal et al, in their study found a mean TG level of 139.76mg/dl among ACS group as compared to 121.02±58.6 mg/dl among non ACS group, which was not found to be statistically significant (p=0.09).[7] In the present study, the Total cholesterol and LDL cholesterol levels were significantly elevated in patients with ACS and central obesity.

The study found out that the serum adiponectin levels were reduced in both the groups as compared to normal levels, but there was a further reduction in adiponectin level in patient with ACS and central obesity (p value <0.00049).

The mean serum adiponectin level in ACS with central obesity was 2.326±1.43µg/ml as compared to 3.486±1.699µg/ml in ACS patients without central obesity, which was found to be statistically significant (p<0.001). Though the serum adiponectin level was reduced in both the groups, a significant further reduction in level was found in patients with central obesity as compared to those without central obesity. A similar observation of the reduced Serum Adiponectin level was observed by Mittal et al, in ACS group where the level was 9.03±3.13µg/ml as compared to 16.47±7.88µg/ml in non-ACS group, which was found to be statistically significant (p<0.001).[7] The present study is in concordance to a study done by Mittal et al, in GB Pant Hospital, New Delhi who compared the serum adiponectin level in patients with ACS and also correlated to its severity with the help of coronary angiography. The study included 90 individuals. The study found out a reduced level of serum adiponectin in patients with ACS as compared to the normal group with adiponectin value of 9.03±3.13μg/mL (P <0.001) in the ACS group and 16.47±7.88μg/mL in non ACS group. They also correlated that the severity of coronary lesion was high in patient with low adiponectin level.[7]

A study done in GTB hospital, New Delhi by Jain et al, which considered the above mentioned variable and also carotid intima media thickness included 100 participants and found out reduced levels of serum adiponectin in patients with ACS as compared to normal individuals.[8]

Similarly, a study which was done in Brazil by Gustavo et al, who included the patients with acute coronary syndrome found out reduced adiponectin levels in the cases and also showed the prognostic importance of serum adiponectin level for further cardiovascular events.[9]

The relation between serum adiponectin level and central obesity was more specific and was not totally dependent on BMI as patient with normal BMI had significantly raised waist to hip ratio and reduced serum adiponectin level as was indicated in a study done by Chiara et al, who said that hypoadiponectinemia played an important role in metabolic syndrome and cardiovascular disease.[10]

Hence it was observed from the study that serum adiponectin level was decreased in patients with acute coronary syndrome and even more reduction of adiponectin level was found in ACS patients with central obesity. It was also observed that serum adiponectin level was also reduced in patient with normal BMI but increase waist to hip ratio.

CONCLUSION

The serum adiponectin level was found to be reduced in both the group irrespective of the presence or absence of central obesity. There was a significant reduction in serum adiponectin level in patients with central obesity as compared to patients without central obesity. Therefore, low serum adiponectin level may be considered as a risk factor for ACS irrespective of central obesity. It was also concluded that patients with central obesity according to waist to hip ratio had further reduced serum adiponectin level as compared to those according to BMI. The study concluded that reduced level of serum adiponectin may aid in early detection of atherosclerotic cardiovascular disease, metabolic syndrome and may also serves as a biomarker for CAD.

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