Section: Physiology

Original Research Article

STUDY OF SERUM ADIPONECTIN LEVELS & ITS CORRELATION WITH BMI AND WAIST HIP RATIO IN OBESE WOMEN

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Received : 10/11/2023
Received in revised form : 28/01/2024
Accepted : 13/02/2024

Keywords:
Adiponectin, Obesity, BMI, WHR.

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DOI: 10.47009/jamp.2024.6.1.344

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 1740-1743

Abstract

Background: Obesity has emerged as a huge public health problem with significant health and economic implications. Obese individuals are at greater risk of developing co-morbities like hypertension, dyslipidemia, coronary artery disease, Type-2 DM, pulmonary dysfunctions. Adiponectin, is an anti-inflammatory and anti -atherogenic adipokine. The purpose of this study is to determine Serum Adiponectin levels in Obese individuals and to correlate with BMI and Waist Hip Ratio. The aim & objective is to study serum Adiponectin levels in Obese Women. To compare the results with healthy Non - Obese Women 3. To Correlate BMI and WHR with Serum Adiponectin levels. **Materials and Methods:** This is a case control study in which 30 Obese Women with BMI ≥ 30 in the age group of 18-35 years were the study subjects. The subjects were selected from Medical Endocrine OP, RGGGH, Chennai-3. The control group consisted of 30 age matched Non- Obese Women (BMI < 30). A detailed history & physical examination was done with proper informed consent. Anthropometric parameters like height, weight, BMI, Waist Hip Ratio were measured. Serum Adiponectin using ELISA method was determined in both the groups. **Result:** Data obtained were analysed by unpaired t test in SPSS Software. Pearson's correlation coefficient was used to determine the correlation between Adiponectin levels and BMI & WHR. pvalue < 0.05 was considered significant. The results showed that Adiponectin levels are significantly reduced in Obese participants and serum Adiponectin levels showed a negative correlation with BMI & WHR. **Conclusion:** Adiponectin may be considered a newer biomarker for metabolic diseases and a potential target for the management of obesity and related complications.

INTRODUCTION

Worldwide, the present trend of consumption of excess fast foods and sedentary lifestyle has led to an increase in the prevalence of Obesity. The Adipocytes secrete Adipocytokines including Leptin, Resistin, TNF– α and Adiponectin.[1] Hence Adipose Tissue is considered as a key endocrine organ playing a crucial role in integrating the endocrine, metabolic and inflammatory signals for control and regulation of energy homeostasis.

Adiponectin is a 247–amino acid peptide hormone, discovered in 19952 by Schrerer et al,[2] and is predominately expressed by differentiated adipocytes in White adipose tissue. Adiponectin is the product of most abundant gene transcript 1 (apM1gene).[3,4]

Plasma level of adiponectin

The circulating plasma range of Adiponectin in human subjects is 3–30 µg/ml, accounting for 0.01% of total plasma protein, being considerably more abundant than other adipokines, such as leptin (2–8 µg/l) or tumor necrosis factor (TNF)-α (<8µg/l).[5] Adiponectin exerts its actions on liver, skeletal muscle and blood vessels.

Actions of adiponectin:

I. **Insulin sensitivity:** Adiponectin suppresses Gluconeogenesis and promotes glucose uptake in skeletal muscle by increasing 5' AMP kinase activity.[6] Adiponectin concentration is significantly decreased in obesity and type II DM characterised by insulin resistance.[7]
II. Role of adiponectin in inflammation: Adiponectin reduces inflammation in endothelium, muscle,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

epithelial cells and macrophages. The anti-inflammatory effects of adiponectin are due to suppression of reactive oxygen species and stimulation of expression of the anti-inflammatory cytokine IL-10 and attenuation of inflammatory response involving TNF-α.[8,9]

III. Obesity and Adiponectin: Obesity is a syndrome composed of metabolic disturbances, increased anthropometric variables, increased inflammatory and possibly decreased anti-inflammatory mediators.

Obesity can be classified according to body mass index as

S. No.	CLASS	BMI
1.	Under weight	< 18.5
2.	Normal	18.5-24.9
3.	Over weight	25-29.9
4.	Obese	30 and above

Plasma adiponectin levels are decreased in obesity. This reduction may play a causal role in the development of insulin resistance. Obesity decreases the expression levels of AdipoR1/R2,[10,11] thereby reducing adiponectin sensitivity, which finally leads to insulin resistance, the so-called "vicious cycle". Plasma adiponectin levels are lower in individuals with central obesity than those with peripheral or general obesity. Reduction in adiponectin levels in obese subjects may be correlated with onset of many common diseases such as Type II diabetes, cardiovascular diseases and other complications. Obesity is characterised by a significant infiltration of adipose tissue with immune and inflammatory cells and thus increases both local and systemic levels of inflammatory cytokines. This dysregulation of cytokine and adipokine production is the key factor that strongly contributes to the onset of many complications in obesity.[12]

Aim & objectives:

- To compare the serum Adiponectin levels between Normal and Obese women
- To correlate Adiponectin levels with BMI and Waist Hip Ratio in Obese women.

MATERIALS AND METHODS

This study was conducted at Institute of Physiology, Madras Medical College, Chennai-3. 30 Obese women in the age group of 18-35 years with BMI ≥ 30 (obesity defined as per WHO Criteria) were the study participants. The subjects were selected from Medical Endocrine OP, RGGGH, Chennai-3. The control group consisted of 30 age matched normal healthy women (BMI 18.5-24.9). The study protocol was approved by the institutional ethical committee.

Inclusion criteria

Women in the age group of 18 – 35 years with BMI ≥ 30.

Exclusion criteria

Pregnancy, Post- partum period, Systemic disorders like Diabetes, Hypertension, Hypothyroidism or any medical illness. Subjects who use antiobesity drugs or Glucocorticoids, Oral Contraceptives are excluded from the study.

Study Design: Case control study.

All subjects were explained about the procedures to be undertaken. After obtaining informed consent a detailed history & physical examination was done. Various parameters like Height, Weight, BMI, Waist Hip Ratio were measured. BMI calculated using Quetelet's index.

BMI = Weight(in Kgs)

Height (in meter)2.

Waist Hip Ratio was calculated from Waist Circumference & Hip Circumference. With all aseptic precautions a venous blood sample of 3 ml was collected in the fasting state from both the groups. The sample was centrifuged immediately and serum was stored at-20 degree Celsius until all the samples were collected. Serum Adiponectin was estimated by commercially available Enzyme – linked immunosorbent assay (ELISA) Kit (RAYBIO R) based on sandwich principle according to the guidelines given by the producer.

Statistical Analysis: Using the Statistical Package for Social Sciences (SPSS) software version 21, all the data obtained were analyzed. Mean and standard deviation of the variables were determined for the control and Obese groups. Unpaired t test was employed for statistical analysis as the test of significance at 95% confidence interval. Pearson's correlation coefficient was used to determine the correlation between Adiponectin levels and BMI & Waist Hip Ratio. pvalue < 0.05 was considered as significant.

RESULTS

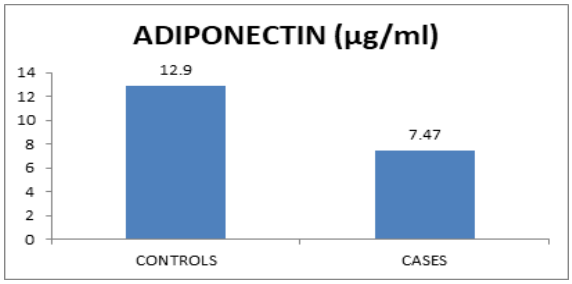

Figure 1: Comparison of Serum Adiponectin levels between Cases & Controls

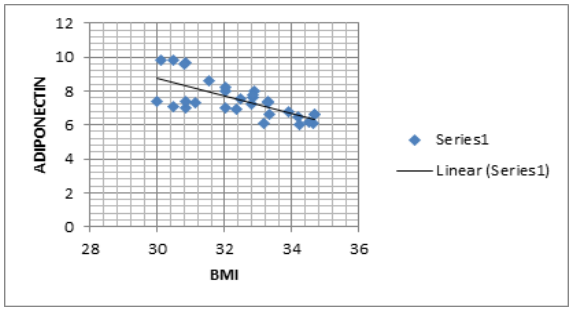

Figure 2: Correlation between Serum Adiponectin levels and BMI in cases

ISSN (O): 2687-5365; ISSN (P): 2753-6556

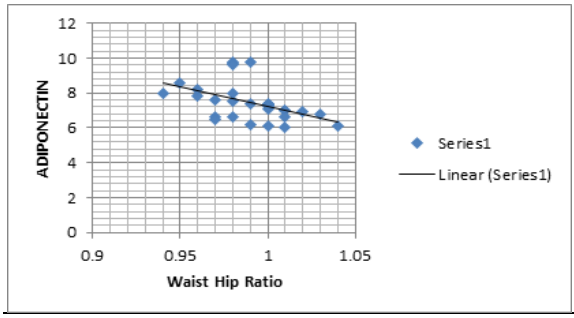

Figure 3: Correlation between Serum Adiponectin levels and WHR in cases

Table 1: Comparison of Baseline Characteristics & Obesity Indices among the study groups

Variable	Study Group	Number	Mean	SD	p value
Age (yrs)	Controls	30	26.37	4.06	0.54
	Obese		25.63	5.24	
Height (meters)	Controls	30	1.61	0.06	<0.01
	Obese		1.56	0.06	
Weight (kgs)	Controls	30	55.87	6.45	<0.01
	Obese		79.77	5.46	
BMI	Controls	30	21.24	1.36	<0.01
	Obese		32.44	1.47	
Waist Hip Ratio	Controls	30	0.82	0.04	<0.01
	Obese		0.99	0.02	

Table 2: Comparison of Serum Adiponectin levels among the study groups

Variable	Study Group	Number	Mean	SD	p value
Serum Adiponectin (µg/ml)	Controls	30	12.9	1.40	<0.001
	Obese		7.47	1.10	

Table 3: Correlation of Serum Adiponectin levels with BMI & WHR using Pearson's Correlation coefficient.

Corrrelation between Adiponectin level and	Correlation value(r)	Significance
BMI of Obese group	-0.696	p-value<0.001
WHR of Obese group	-0.463	p-value<0.001

DISCUSSION

The current research compared the Adiponectin levels between normal and Obese women and correlated the Adiponectin levels with anthropometric indices like BMI & WHR. There are not much Indian studies that investigated the Adiponectin levels in obesity and hence this study was done. The results obtained in this study showed that Adiponectin levels are significantly reduced in Obese women participants than when compared with non-obese control groups and serum Adiponectin levels showed a negative correlation with BMI & WHR.

The results of this study are very much in accordance with the results of Mamaghani F et al,[13] who demonstrated that in subjects with normal weight the mean serum adiponectin was significantly (1.2-fold) higher than in obese subjects and the results also indicated a negative correlation between adiponectin and BMI and WHR. Results obtained in another cross-sectional study on the Indian-Caucasian women and men also demonstrated that there was an inverse correlation between adiponectin and BMI and body fat mass.[14,15]

There is a paradoxical reduction in Adiponectin levels in obese than in lean humans while the levels of most other adipocytokines, are increased in obesity in proportion to increasing total body fat mass. In individuals with obesity, as BMI and body fat mass increases, adiponectin mRNA expression in adipose tissue is decreased, and low serum adiponectin levels are related to a higher risk of diabetes, CVDs, Dyslipidemia, Atherosclerosis.[16,17]

The molecular basis of down-regulation of adiponectin gene expression and its secretion from adipose tissue in obese subjects is not well understood. However, some researchers have suggested that eventhough adiponectin expression is activated during adipogenesis, a feedback inhibition in its production occurs during the development of fat mass due to increase in the production of other adipocytokines. Adipocytokines such as TNF-α may decrease adipocyte expression and secretion of adiponectin.[18] Another reason may be the decrease in half-life of adiponectin molecules in blood circulation of obese subjects and increase in molecule degradation.[19] It is also suggested that as the grade of obesity increases, there may be a decrease in the metabolic functioning of adipocytes, along with hypertrophy and/or aging of these cells.[20] There is a strong negative relationship between Adiponectin and visceral fat than that of subcutaneous fat because Adiponectin is produced by the visceral fat. This is because less adiponectin is produced by the TGL filled visceral adipocytes which are less insulin sensitive.[21]

CONCLUSION

To conclude, the results of this study show that serum adiponectin levels decreased with obesity and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

negatively correlated with BMI & WHR. Adiponectin has emerged as an anti-atherogenic, anti-inflammatory, cardio-protective, insulin-sensitizing adipokine that appears to protect against obesity-related metabolic disease. A series of clinical and experimental studies have highlighted these biological roles. Pharmacological approaches that increase circulating plasma adiponectin levels or enhance the molecular signaling of adiponectin will certainly form the basis for future therapeutic interventions. Further experimental studies should shed light on the pathophysiological mechanisms of adiponectin and may provide promising targets for the prevention and treatment of obesity, the metabolic syndrome, and cardiovascular disease.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556