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The Study of Serum Tumor Necrosis Factor-Alpha and Adiponectin Levels as Diagnostic Markers in Obese Patients

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ABSTRACT

Background: Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health leading to reduced life expectancy and or increased health problem. Adipose tissue derived hormone and protein, e.g. leptin, tumor necrosis factor-alpha, adiponectin, interleukin-6. All these proteins play important role in lipid metabolism.

Aim: Aim of present study was to evaluate biochemical parameters for diagnosis of obesity as well as displaying the role of inflammatory markers in pathogenesis of obesity.

Materials and methods: The present study consisted of 50 obese patients and control group included the age of 50 and sex matched. Demographic data and clinical history of each subject was recorded. Anthropometric measurements were recorded of each subject. The biochemical parameters such as lipid profile, tumor necrosis factor-alpha and adiponectin were done.

Results: The results were expressed in mean ± standard deviation. Comparisons of study group and study group to control group were done by applying test of difference between two sample means at 5% (p-0.05) and 1% (p-0.01) level of significance. In current study, mean levels of total cholesterol, TG, LDL were significantly ($p<0.01$) higher in obese patients as compared to healthy controls while serum level HDL-C was lower in obesity but not statically significant. Increased level of tumor necrosis factor-Alpha in serum was seen in obese patients compared to controls while serum adiponectin level was significantly lower in obesity patients when compared with healthy control ($p<0.01$).

Conclusion: The tumor necrosis factor-Alpha serum levels were higher while adiponectin levels were lower in obese individuals. Thus the evaluation of these parameters is a crucial step, towards management of obesity and it may help in predicting and also early management of the expected complications.

Keywords: Obesity, Tumor necrosis factor-alpha, Adiponectin

INTRODUCTION

Obesity is a leading preventable cause of death worldwide. The prevalence is increasing in adults and even children. It has been seen that it is the most serious health problem of the 21st century [1]. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and or increased health problem [2].

Prevalence of obesity is increasing worldwide. At least 2.8 million people die each year due to obesity. Obesity is more common among women, low socioeconomic population due to poor-quality diet, sedentary lifestyle and family history of obesity [3]. This rising prevalence of obesity has aroused the interest of researchers in exploring adipose tissue metabolism. Adipose tissue derived hormone and protein, e.g. leptin, tumor necrosis factor-alpha, adiponectin, interleukin-6. All these proteins play important role in lipid metabolism. In adipose tissue inflammation or dysfunction, adipokines secretion is altered. Adiponectin is an adiposity specific protein which modulates the metabolic process like glucose regulation and fatty acid metabolism. Adiponectin secretion is inhibited by increasing TNF-alpha-pro-inflammatory cytokines exerting numerous effects in adipose tissue including lipid metabolism [3,4].

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Thus aim of present study was to evaluate biochemical parameters in diagnosing obesity as well as displaying the role of inflammatory markers in pathogenesis of obesity and its related consequences which may help in management of expected complications.

MATERIALS AND METHODS

The present case control study was conducted in the department of Biochemistry in collaboration with the department of medicine of DVVPF's Medical college and Hospital. The study group consisted of 50 obese patients and control group included people of age 50 and sex matched healthy controls. Depending upon the BMI, theses subject were divided into two groups with BMI ≥ 30 kg/m^2 and control i.e. non obese group with BMI of 18.0-22.0 kg/m^2. All subjects gave informed consent and the study protocol was approved by institutional ethics committee.

Exclusion criteria

Patients with acute infection, myocardial infraction (MI), diabetes mellitus, hypertension thyroid disease, taking drugs like anti-inflammatory or antibiotics were excluded from study.

Inclusion criteria

All patients were diagnosed by physician and their mean body mass index (BMI) was greater than 30 kg/m^2.

Definition of anthropomorphic indices of obesity

According to the World Health Organization guidelines, obesity was defined as a BMI ≥ 30 kg/m^2, waist circumference >94 cm in men and 80 cm in women. Waist hip ratio ≥ 0.90 in men and ≥ 8.5 in women [5].

Sample collection

After 12 h of overnight fast, 7 ml of blood was collected from each subject by venepuncture with standard blood collection technique in plane vacutainer and (yucca diagnostic) and sodium fluoride vial sample were centrifuged at 2500 rpm for 10 min. Serum and plasma collected and stored at -70° until biochemical studies.

Methodology

Demographic data and clinical history of each subject was recorded. Anthropometric measurements were recorded of each subject. The biochemical parameters such as lipid profile, tumor necrosis factor-alpha and adiponectin were done.

1. Estimation of lipid profile: Cholesterol oxidase peroxidase (CHOD-PAP) method was used for estimation of serum, total cholesterol and HDL-C. Enzymatic glycerol 3-phosphate oxidase (GPO-PAP) method for serum triglyceride (TG) (kit manufactured by Span Diagnostic Ltd.) using semi-autoanalyser. LDL-C calculated by using Friedelwald formula (LDL-C=total cholesterol-TG/5-HDL-C) [6-9].
2. Serum TNF-alpha: Determination of TNF-alpha (by Boster Biological Technology Co. Ltd., Wuhan, China) levels were measured using commercially available enzyme-linked Immunosorbant Assay ELISA kit [10].
3. Serum adiponectin: Serum adinopectin was measured by enzyme-linked immunosorbant assay (Sigma Aldrich) [11].

STATISTICAL ANALYSIS

Statistical software SYSSTAT-12 (By Cranes Software, Bangalore) was used to analyze the data. The results were expressed in mean ± standard deviation (mean ± SD). Data was analyzed by descriptive statistics as mean, SD. Comparisons of study group and study group to control group were done by applying the test of difference between two sample means at 5% (p-0.05) and 1% (p-0.01) level of significance.

Correlation analysis was done by determining Karl Pearson's correlation coefficient for positive and negative correlation between various parameters in all groups under study. Correlation was tested by students 't' test at 5% (p-0.05) and 1% (p-0.01) level of significance.

RESULTS AND DISCUSSION

Table 1 showed that mean levels of Total Cholesterol, TG, LDL were significantly ($p<0.01$) higher in obese patients as compared to healthy control while serum level HDL-C was lower in obesity but not statically significant.

Table 1 also illustrated that increased level of tumour necrosis factor-Alpha in serum was seen in obese patients compared to controls. While plasma adiponectin level was significantly lower in obesity patients when compared with healthy control ($p<0.01$).

Table 1. Values were expressed in mean with standard deviation (Mean ± SD).

S. No.	Subject Characteristics	Obesity (N=50)	Control (N=50)
1	Age	26-63	26-63
2	Sex (M/F)	24/36	31/29
3	BMI (kg/m^2)	34.7 ± 3.8	17.0 ± 3.5
4	WHR	1.05 ± 0.12	0.8 1 ± 0.11
5	Systolic BP	123.6 ± 8.2	115.6 ± 3.2
6	Diastolic BP	75.4 ± 5.0	74.8 ± 7.1
7	Total cholesterol (mg/dl)	188.4 ± 12.5 **	135.2 ± 20.0
8	Triglyceride (mg/dl)	105 ± 3 ± 39.7 **	75.8 ± 27.0
9	LDL-Cholesterol (mg/dl)	90.1 ± 15.03^{NS}	85.1 ± 22.6
10	HDL-Cholesterol (mg/dl)	37.8 ± 3.1^{NS}	38.8 ± 40
11	Tumour necrosis factor-Alpha (pg/ml)	37.8 ± 11.3**	28.6 ± 4.8
12	Aponetin (mg/L)	6.54 ± 2.01**	7.9 ± 1.2

***p<0.01-considered as highly significant*

DISCUSSION

Obesity is due to excessive fat accumulation that may impair health resulting from social behavior and environmental and genetic factors [12]. Obesity and its associated conditions such as insulin resistance, type 2 diabetes, dyslipidemia, etc. represent major challenges for basic science and clinical research [13].

During last decade, several studies demonstrated the important role of adiponectin in the regulation of various physiological processes including insulin responsiveness, glucose and lipid metabolism as well as endothelium function, inflammatory response and cytokine signaling. Thus, this study was designed to explore the relationships of adiponectin, tumor nerosis factor-Alpha with various anthropometric indexes of in obese population [14].

In the current study, we studied serum lipid profile of control and study group. In that serum cholesterol, triglycerides levels were significantly high in study group. However, HDL-Cholesterol levels were not significantly decreased. Our results are strongly co-ordinated with previous research [5]. Obesity in type 2 diabetes mellitus had strong positive correlation with serum cholesterol and triglycerides [15,16].

In present study, TNF-alpha was significantly higher in obese patients than in the control group. This result was strongly matched with one of the recent studies which reported that the TNF-alpha level was significantly greater in obese group when compared with control group. Ahmet celik et al. [17] has studied relationship between the new anthropometric obesity parameters and inflammatory markers in healthy adult men. According to them, both general and abdominal obesity have a pretendency toward high inflammatory markers.

In this study, serum adiponectin level was significantly lower in the obese patients as compared to control group. These results were exactly matched with Marta et al. [18]. According to their study, serum adiponectin level was decreased in obese subjects. They also found adiponectin in adipose tissue of obese and normal-weight individuals and finally concluded that, obesity affects synthesis of adiponectin in subcutaneous adipose tissue. As per Clarisse Noel et al. [5], there was association of serum adiponectin and leptin with anthropomorphic indices of obesity in a Sub-Saharan African population. Adiponectin is associated with reduced adiposity especially abdominal adiposity, improved insulin sensitivity and lower level of pro-atherogenic blood lipoproteins [5].

CONCLUSION

The biochemical parameters related to lipid were significantly altered. The tumor necrosis factor-Alpha serum levels were higher while adiponectin levels were lower in obese individuals. Obesity is a pandemic condition that leads to health impairment by increasing the developing diseases such as diabetes mellitus, cardiovascular diseases. Thus the evaluation of these parameters is a crucial step, towards management of obesity and it may help in predicting and also early management of the expected complications.

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