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Determination of Cortisol hormone level according to obesity classification in some adult men.

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Abstract

Objective: To evaluate whether serum concentration of cortisol in some healthy adult's men influenced by their characteristics of anthropometric measurements. Subjects and Method: Ninety-eight volunteer adult's men non-smoking (20-50) years in this study, the blood samples were taken from subjects at the morning during 8:30-10:30 am during November 2015 till April 2016. ELIZA kit was used to assay the serum level of cortisol hormone, and the anthropometric measurements have been done such as; body weight, height and waist circumference(WC) to calculated body mass index (BMI), and percentage of body fat (BF%) by a special formula and the subjects were assorted depending on classes of anthropometric (physical) measurements. Results: cortisol level showed a significant decrease ($p<0.05$) in obese and overweight as compared with normal weight group in accordance with classes of BMI categories as well there was a significant decrease in obese group as compared with other group according to body fat percentage classification, also seen significant decrease of cortisol level in group with large waist circumference ≥ 90 as compared with small waist circumference group. In addition, it was noticed that was a significant negative correlation between that tested hormone with anthropometric measurements Conclusion: Class of obesity was the key factor in deciding of tested hormone concentration and the state of correlation between hormone level and anthropometric values.

Keywords :obesity, men, anthropometric measurements, cortisol hormone.

Introduction

The stable body weight depends on an equal balance calories intake from food and expenditure of calories, where both leisure and working time are increasingly sedentary as people more from one seated position to another in their use of the automobile, television ,videogames and the computer and the lake of physical activity these lead to that extra calories will stores in the fat cells present in adipose tissue, these all certainly the major role in the current epidemic of obesity as well as recent

researchers has suggested that endocrine and genetic, physiological, behavioral factors also play a significant role in the etiology of obesity[1,2],as well other studies were suggested that class of obesity may have a role in variation level of some neurotransmitter hormones in some adult men[3,4]. The world health organization clacification [5] for obesity is based on the body mass index (BMI), which is the weight (in kilograms) divided by the square of height (in meters), but only the BMI is a crude indicator of body fat content, waist size is a better correlation of total body fat than BMI [6]. Body fat percentage is total body fat expressed as a percentage of total body weight, there is no generally accepted definition of obesity based on total body fat, however most researcher have used >25% in men as cut- points to define obesity [7], where if the body of human in normal weight but having a high fat percentage, it may be having the same health risk of the obesity[8], the body fat distribution has a wide variation count than the body mass index [9],so when assessing health risk it is important to measure waist circumference as noted by another literature [10] in which recommended thresholds of waist circumference in men (102 cm) that correlated with BMI 30, but individuals with a waist circumference greater than proposed thresholds generally have worse metabolic profile than individuals with a waist circumference below these thresholds. Classification of adult men according to fat percentage categories [11] showed in table 1.

Table 1. General body- fat percentage categories in adult men

Description	Men
Essential fat	**2-5 %**
Athletes	**6-13 %**
Fitness	**14-17 %**
Acceptable	**18-24 %**
Obese	**25 % +**

Adipose tissue is a major endocrine organ, producing various hormones that regulate body metabolism [12] which decrease or increase in these hormones may lead to obesity. One of study has shown that cortisol plays a role in weight control and can have a lipolytic effect (promote the breakdown of fat), under some conditions, cortisol may somewhat suppress lipolysis [13] Also, cortisol functions to increase blood sugar through gluconeogenesis, and to aid in the metabolism of fat, protein, and carbohydrates [14]. Another known to cortisol hormone (stress hormone) that secreted by the Hypothalamic-Pituitary-Adrenal (HPA) as showed in figure 1, affects our body in both physical and mental ways that can be detrimental to our overall health. Some of the effects of stress can be due to our genes, while some effects can be due to external environmental factors [15].

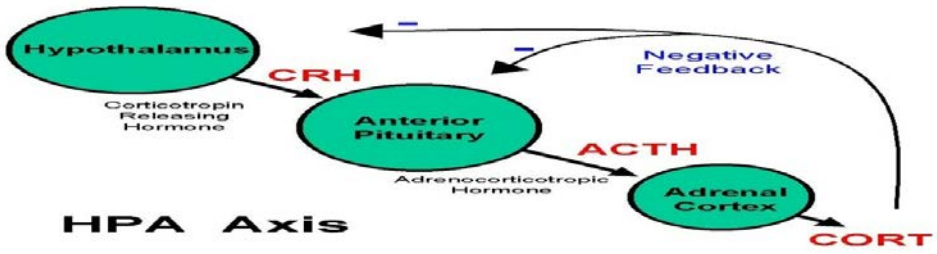

Fig. 1: The Hypothalamic-Pituitary-Adrenal (HPA) mechanism [16].

Accordingly, this study has been suggested to check cortisol level in some individuals complains with gaining weight and detectable any relation may be existing for cortisol hormone with these anthropometric measurements for subjects who taking part in this study.

Material and Methods

Subjects and blood collection

The present study was conducted in the college of science for women, university of Babylon, subjects enrolled in this study involved (98) volunteer seemingly healthy with ages arranged (20-50) years. Non-fasting blood samples were taken from

the subjects enrolled in this study in the morning during 8:30-10:30 o'clock for the period at the beginning of November 2015 till April 2016 ,those selected adults who have not-smoking men, are subdivided into a subgroup according to BMI (fat mass) and the percentage of fat body (fat distribution) and waist circumference (fat abdominal) classes to elucidate the state of tested hormone depending on obvious physical (anthropometrical) variables including in present study .

Anthropometric measurements

Body Mass Index (BMI) was calculated by the following equation [5].

BMI= weight (kg)/square height (m^2).

The world health organization report [3] was classifies Body Mass Index into: desirable weight which having a BMI value range between (18.5- 24.9) kilogram/square meter, while the overweight (25 - 29) kilograms/square meter, and medium obesity as major or equivalent to thirty kilograms /square meters, and finally morbid obesity as major or equivalent to forty kilograms /square meters

The Body fat percentage was calculated by the following equation [17].

Lean body weight =94.42+1.082(weight in pound)-4.15(waist in inches)

Body fat %= (body weight –lean body weight *100)/body weight.

The protocol of the waist measurement is based on measuring the level of the umbilicus in the horizontal level around the center by using a flexible tape measure, not stretchable ask the subject to rest while he's exhaling to get the most accurate measurements [18]

The limitations of the waist circumference of 94cm to 88 cm for men associated with a BMI of 25 kg / m^2 is shown to be a risk to health as displayed in European Community [6]. However, the cut- off point values of (WC) for men 90 cm associated with BMI of 25kg/m^2 which was applied in our study by reason an action level of (WC) is more appropriate with demographic features in our study population and provided more noteworthy statistics. Thus, our population is assorted into two subgroups, one that includes subjects with large (WC ≥ 90 cm) whereas another group that included subjects with small (WC) <90 cm.

Determination of serum Cortisol concentration

Cortisol concentration was measured by Enzyme Linked Immune Sorbent Assay kit of CALBIOTECH (A life science company). The standard curve of Cortisol determination was plotted in figure 2:

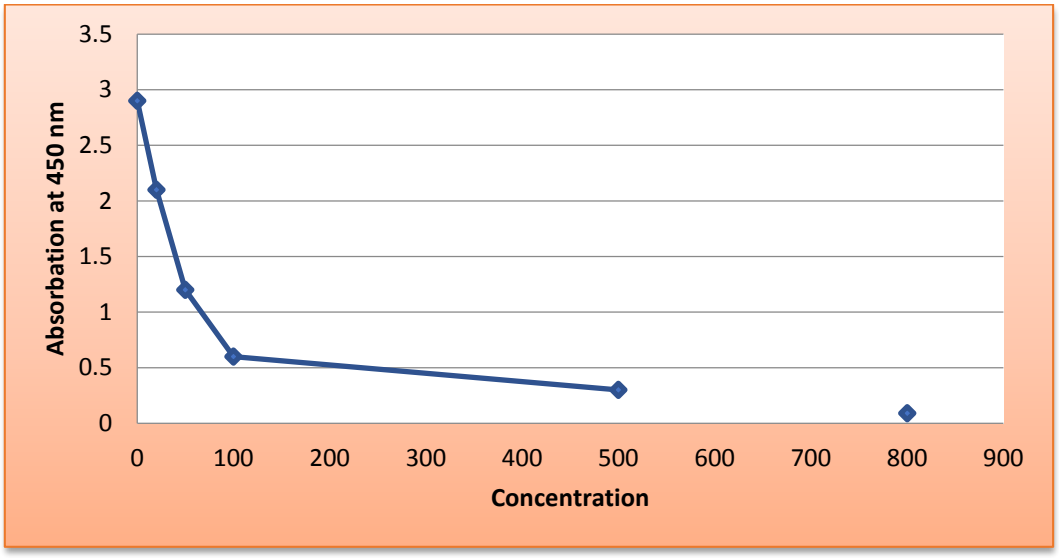

Fig. 2: The standard curve of Cortisol concentration

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Statistical Analysis:

Data analysis was carried out on SPSS (version 18.0), data are shown as mean ± SD, t-test and a nova was used to determine statistical parameters for the differences among the subjects studied. Post hoc test used to multiple comparison amongst investigated features constructed on BMI, WC, and type of fat percentage in the body, linear regression analyses were done to explore the association between investigated hormone and anthropometric parameters depending in the present study, the value of $p < 0.05$ was considered statistically significant.

Results

Table (2) shows that cortisol level was significantly lower in both obese and overweight subjects (409.5±221.9,344.1±249.2 ng/ml) respectively than subjects in normal weight group(529.7±139.9ng/ml) but there was no significant difference in cortisol level between overweight and obese group.

Table (2): values of cortisol, body fat percentage and waist circumference according to BMI categories

Parameters	BMI (kg/m2) categories		
	Normal weight (G1), n=20 Mean ± SD	Overweight (G2), n=24 Mean ± SD	Obese(G3), n= 54 Mean ± SD
Cortisol (ng/ml)	529.7± 139.9	344.1± 249.2 **	409.5± 221.9 *
Body fat %	19.0± 6.2	28.0± 4.1 ††	31.0± 3.2 †
WC (cm)	85.7± 9.0	98.7± 5.7	111.7± 7.8 †

*p<0.05 Vs(G1), ** p<Vs(G1), †p<Vs (G1 and G2), ††p<Vs(G1)

Table (3): values of BMI and waist circumference according to body fat percentage categories

Parameters	Body fat percentage categories			
	Athletes(G1) n=5 Mean ± SD	Fitness(G2) n=3 Mean ± SD	Acceptable(G3) n= 14 Mean ± SD	Obese(G4) n= 76 Mean ± SD
Cortisol (ng/ml)	573.0± 121.2	529.9± 126.8	523.6± 139.3	384.0± 232.4 *
BMI (kg/m^2)	20.2± 1.4	22.9± 0.4	25.2± 2.3 +	32.4± 4.4 †, **, *
WC (cm)	74.6± 4.2	80.3± 2.5	91.6± 5.6 +, ††	108.1± 9.0 †, **, *

*p<0.05 Vs(G3), ** p<Vs(G2), †p<Vs(G1), ††p<Vs(G2), +p<0.05Vs(G1)

In accordance with body fat percentage categories were observed in table 3 highly significant ($p<0.05$) reduction in serum cortisol level in obese individuals as comparison with acceptable group, whereas no significant difference was seen in cortisol level among (acceptable, fitness, athletes) groups. However, in the case of comparison in the level of cortisol hormone depending on waist circumference measurements, there was highly significant ($p<0.05$) decrease of cortisol level were seen in the sera of large (WC) group compared with small (WC) group as exhibited in table (4).

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Table (4): values of cortisol, body fat percentage and BMI according to waist circumference categories.

Parameters	waist circumference (cm)	
	WC ≥ 90 (Large WC) N= 84 Mean ± SD	WC < 90(Small WC) N= 14 Mean ± SD
Cortisol (ng/ml)	402.4± 228.6*	511.9± 154.6
Fat body %	29.7± 4.0*	16.5± 5.1
BMI (kg/m2)	31.7± 4.7 *	22.7± 2.7

*at p< 0.05 is significantly differences between group.

The status of relation for anthropometric parameters with cortisol level among subjects of our study revealed a significant negative correlation(r= -0.57, p= 0.03, n= 14) between serum cortisol (ng/ml) level and BMI(kg/m^2) among the acceptable group as showed in figure 3 ,as well the subjects with normal weight showed a significant negative correlation(r= -0.46, p= 0.04, n= 20) between serum cortisol level and body fat percentage as revealed in figure 4, also the group with small waist circumference (<90 cm) exhibited a negative correlation (r= -0.70, p= 0.005, n= 14) between serum cortisol level and body fat percentage value as showed in figure 5.

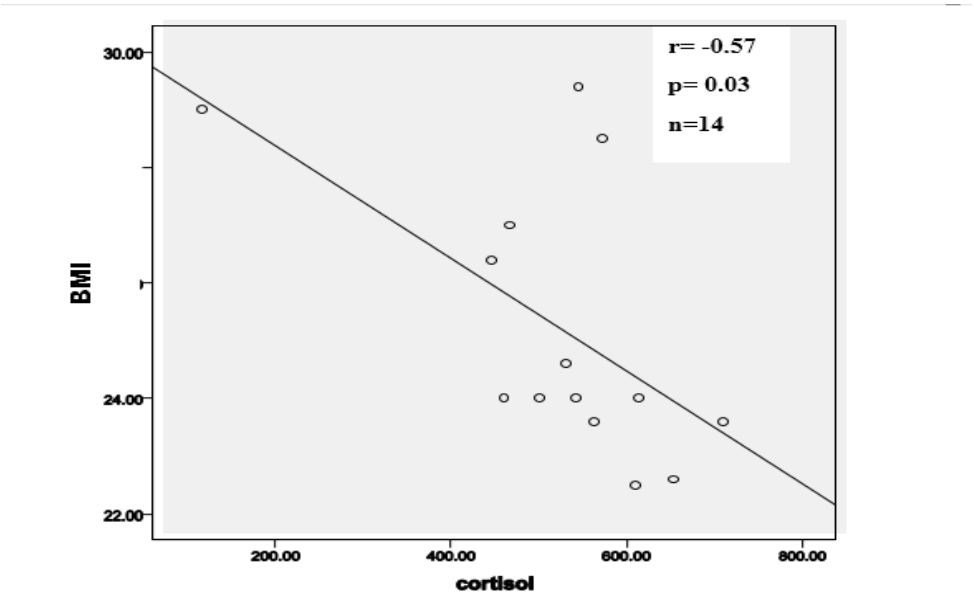

Figure (3): relationship of serum cortisol (ng/ml) concentration to BMI(kg/m^2) in acceptable subjects.

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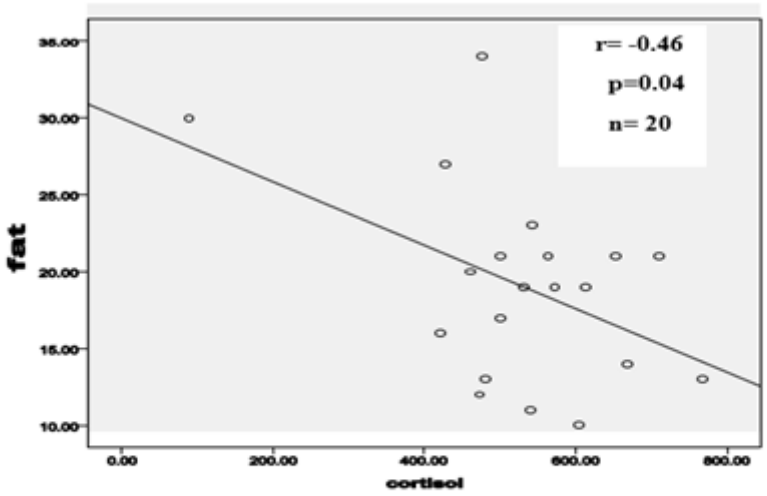

figure (4): relationship of serum cortisol (ng/ml) concentration to body fat percentage % in normal weight subjects

Concentrations and siginificant differences were recorded between initial and residual concentrations after 3, 5, 7, 14 and 35 days.

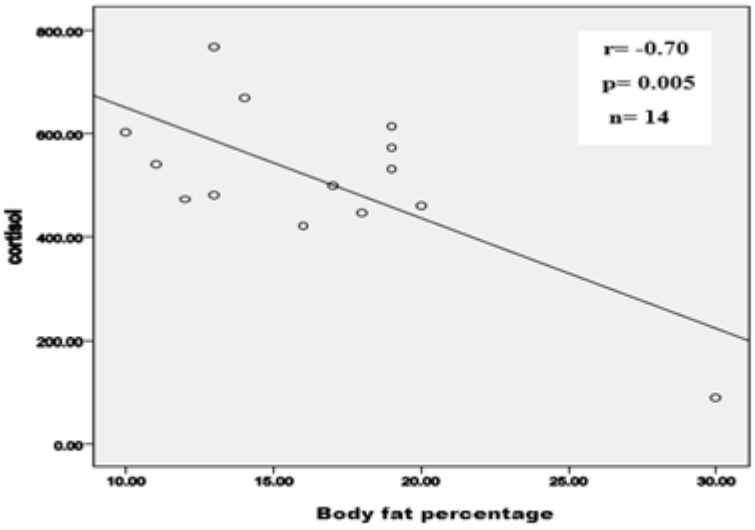

Figure (5): relationship of serum cortisol (ng/ml) concentration to body fat percentage in [small (WC) group].

Discussion

The growing body describing two-way interactions between adrenal hormones and the endocrine adipocyte has resulted in the existence of an " adipose- adrenal axis" [19]. In consistent with this theory, data for subjects in our study showed that higher cortisol level associated with greater BMI (fat mass) while lower cortisol level associated with greater body fat percentage and larger waist circumference measurement , this obtain agree with study in which review that ten (10)-kg/m^2 raise in Body Mass Index might promote the cortisol making rate up to 2.5- fold in subcutaneous adipose tissue and that, accounting for linked ≈ 15kg raise in accumulation of fat, this associated with an increase in whole- body adipose production of cortisol[20] . There was a potent effect of cortisol is may be regard in adipose tissues, influencing insulin sensitivity, fatty acid metabolism, and body fat distribution [21]. Other research review that cortisol alone may not be major contribute in weight gain, thus that glucocorticoids are part of chain of hormonal and neuronal signals associated with obesity [22]. The

glucocorticoid hormone (cortisol) action is important in the regulation of adipose tissues distribution and influences in a variety of biological processes and health- related outcomes [23,24], this review is consistent with our observation that indicate higher level of cortisol hormone in subjects with normal body weight. Our finding agreement with suggestion by[25] whom indicated that high cortisol levels in the blood are an important factor for the increased lipogenesis as well as reduced fat mass and reduced body weight, as related with previously presented, the cortisol hormone has an important advantage as plays two roles a protecting role and adaptation role, to meet the stresses states, it discharges sugar and fat stores of body and also works against inflammation [26]. So, elevated of cortisol level found in persons with both increased emotional stress and higher percentage of body fat [27]. The results of current study showed that adult men with an average BMI in the order normal weight have excess cortisol level, it could be cortisol released as compensatory mechanism devoted to stressful life events [28], other literature was considered that cortisol hormone have both role in fat storing and fat burning hormone because of its increases in the activity of lipoprotein lipase [30] that when individuals under acute stress activate the release of catecholamine parallelism with cortisol to exerts their influence on lipolysis and suppresses fat storing, while chronic stress will release (neuropeptide –y) combined with cortisol that makes the body more responsive to this fat storing and greater gain fat. Concomitantly, short-term stress helps burn fat, while chronic stress increased fat storage [28], so our proposition that the same mechanism to this response in our population may be present. Cortisol and visceral body fat are known to have strong influence upon one another, visceral fat allows for much greater blood flows contains increased glucocorticoid receptors and hence more sensitive to the fat accumulation when it encounter cortisol [31]. However, this implied about correlation for cortisol activity with WC measurement and BMI values. As regard with previous studies in which review the correlation, one of them found that serum cortisol but not plasma concentration may correlate with abdominal diameter and waist-hip ratio [32], but another study supposes, that cortisol secretion did not correlate with weight, unrelated to hip or WC measurement [33].

Conclusions

The statement of cortisol level correlated with anthropometric values were influenced by the degree of subject's obesity. This could be due to double role of cortisol, which contributes in burn fat in normal weight individual, one more time in storing fat among obese individual, so the class of obesity have a role in deciding of the state hormone level correlated with anthropometric parameters .

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