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CORTISOL AND ITS RELATIONSHIP TO OBESITY AMONG MARRIED WOMEN

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ABSTRACT

Obesity is a major risk factor for mortality worldwide, significantly increasing the risk of developing chronic diseases such as heart disease and cancer. Cortisol has a wide range of physiological effects throughout the human body and plays a role in glucose and lipid metabolism, body composition, and immunosuppressive and anti-inflammatory responses. Any defect in this can lead to obesity and metabolic syndrome in healthy individuals, The aim is to study the level of cortisol concentration in the blood and its relationship to obesity in married women. A total of 110 married women, aged 20-40 years, participated in this study. Anthropometric measurements were taken and a blood sample was collected for laboratory tests. questionnaire and signed unset was obtained. The results shows that there were significant differences between waist circumference, hip circumference, weight and BMI. The statistical test showed a significant differences in hematological profile, which significantly increased with the increase of BMI, Except for the platelet which is not significant. results also showed that there were no significant differences between the BMI groups for cortisol concentration. The correlation between the level of cortisol concentration and the obesity showed that there was medium negative correlation (r = - 0.489) with significant differences (p = 0.006).

KEYWORDS: obesity – cortisol – Body mass index - waist circumference - hip circumference - hematological profile).

INTRODUCTION

Obesity is a major risk factor for mortality worldwide, significantly increasing the risk of developing chronic diseases such as heart disease and cancer[1]; Thus, understanding the factors that promote the emergence or maintenance of obesity has important therapeutic implications. Obesity is often accompanied by a range of comorbidities including hypertension, impaired glucose tolerance and dyslipidemia, otherwise known as metabolic syndrome[2]; Symptoms of metabolic syndrome are very similar to those of Cushing syndrome, a disorder characterized by excessive endogenous production of cortisol (the stress hormone). Also, several studies have indicated that obesity is associated with increased insulin resistance.[3]

Cortisol has a wide range of physiological effects throughout the human body and plays a role in glucose and lipid metabolism, body composition, and immunosuppressive and anti-inflammatory responses.[4] Neurodeafness that regulates cortisol levels can lead to obesity and metabolic syndrome in healthy individuals, and exposure to physiological or psychological stress leads to activation of the HPA axis, which leads to the release of cortisol, i.e. chronic stress and thus chronically elevated levels of cortisol may promote obesity through Effects on fat accumulation.

The effects of cortisol are mediated via glucocorticoid receptors, which have a particularly high density in peripheral adipose tissue.[5] In fact, animal studies have shown that chronic exposure to physical and psychological stress increases peripheral fat deposition, in addition to affecting fat deposition.[6-7]

Obesity: “A condition in which excessive amounts of fat accumulate in the body, and the main cause of obesity is the excess of the thermal energy of food beyond the body’s needs.” It accumulates in the form of fats that are stored in the body, and it is one of the pathological symptoms that have become common in both developed and developing societies. Obesity may not be considered as a disease in itself, but it is a major and important risk factor for many diseases. Obesity can be defined simply (as an abnormal increase in body fat that may be in all parts of the body or in specific locations.[8]

MATERIALS AND METHODS

Samples: This study was conducted on a number of (110) samples of women attending Wadi Al-Hayat General Hospital, located in Awbari, and the study period was approximately one month. The body mass index (BMI) was measured according to the equation weight (kg)/length(m^2). The samples were divided according to the BMI to: normal BMI (from 18-24.9), overweight (from 25-30), first degree obesity (from 30-35), and excessive obesity (from 35 and above). The hip circumference and waist circumference were measured.

10 ml of blood was collected from the participants and divided in to two tubes, 3 ml was placed in an EDTA anticoagulant tube, for a complete blood count (CBC), and 5 ml was placed in plan tube used for biochemical assays. The samples were left for halfe an hour at a room temperature, and centrifuged at a speed of 3000 rpm for 3 minutes to separate the samples, and the serum was withdrawn into Eppendorf tubes, which were stored at -20°C until tested.

RESULTS

The results of the anthropometric measurements show that there were no significant differences for age and height between groups while statistical tests showed significant differences for waist circumference, hip circumference, weight and BMI. As in table (3.1).

Table No. (3.1): shows the anthropometric measurements of the BMI groups.

	Normal weight (N=38)	Over weight (N=34)	Obesity first degree (N=17)	Excessive obesity (N=22)
Age(year)	29.7±6.90	33.9±8.87	29.8±0.70	34.0±6.17
Waistline (CM)	74.4±8.42	83.4±8.41 P=(0.002)	90.9±11.5 P=(0.001)	99.7±14.1 P=(0.001)
Hip circumference	95.5±10.19	106.7±5.75 P=(0.001)	112.0±27.5 P=(0.001)	121.3±16.3 P=(0.001)
Height (meter)	1.59±0.07	1.59±0.05 P=(0.952)	1.60±0.07 P=(0.759)	1.56±0.07 P=(0.432)
Weight (kg)	56.70±7.65	70.60±5.83 P=(0.001)	81.3±12.62 P=(0.001)	99±10.5 P=(0.001)
BMI (kg/m²)	22.1±1.85	27.6±1.37 P=(0.001)	31.3±1.22 P=(0.001)	40.4±3.43 P=(0.001)

The results of complete blood count showed that there were a significant differences of hemoglobin concentration, red blood cells and white blood cells and between groups while statistical tests showed no significant differences of platelets when normal weight was compared with obesity groups. As shown in table (3.2).

Table No. (3.2) shows the hematological profile of the BMI groups.

Parameter	Normal weight (n=38)	Over weight (N=34)	Obesity first degree (N=17)	Excessive obesity (N=22)
Haemoglobin (g/dl)	11.9±2.12	12.5±1.86 P=(1.00)	13.0±1.45 P=(0.082)	13.4±1.67 P=(0.020)
Red blood cells (10^6 cells/cmm^3)	4.48±0.42	4.56±0.44 P=(1.00)	4.96±0.16 P=(0.014)	4.98±0.72 P=(0.009)
White blood cells (10^3 cells/cmm^3)	6.21±2.43	7.14±1.91 P=(0.521)	8.43±2.89 P=(0.007)	8.31±2.19 P=(0.006)
Platelets count (10^3cells/cmm^3)	300.1±72.9	322.2±97.4 P=(1.00)	301.6±91.2 P=(1.00)	301.6±106.8 P=(1.00)

Table No. (3.3) shows the distribution of blood groups in the BMI groups. It is clear from it that the blood type (O+) is the most common blood group in the four groups, followed by (A+). However, in the fourth group (Excessive obesity), the proportions converged, so the proportion of blood group type A+ (31.8%) and O- (27.3) increased.

Table No. (3.3) shows the blood groups in BMI groups.

Blood group	O (+)	A (+)	B (+)	AB (+)	O (-)	A (-)	B (-)	AB (-)
Normal weight (n=38)	N=18 (47.4%)	N=10 (26.3%)	N=6 (15.8%)	N=3 (7.9%)	N=0 (0%)	N=1 (2.6%)	N=0 (0%)	N=0 (0%)
Over weight (N=34)	N=16 (47.0%)	N=10 (29.4%)	N=5 (14.7%)	N=2 (5.9%)	N=0 (0%)	N=1 (3.0%)	N=0 (0%)	N=0 (0%)
Obesity first degree (N=17)	N=7 (41.3%)	N=4 (23.5%)	N=2 (11.8%)	N=2 (11.8%)	N=1 (5.8%)	N=1 (5.8%)	N=0 (0%)	N=0 (0%)

Excessive obesity (N=22)	N=8 (36.4%)	N=7 (31.8%)	N=0 (0%)	N=1 (4.5%)	N=6 (27.3%)	N=0 (0%)	N=0 (0%)	N=0 (0%)

The statistical test showed that there were no significant differences for cortisol concentration between the four different groups of BMI, despite the decrease in the level of cortisol concentration with an increase in the degree of obesity, as shown in Figure (3.1).

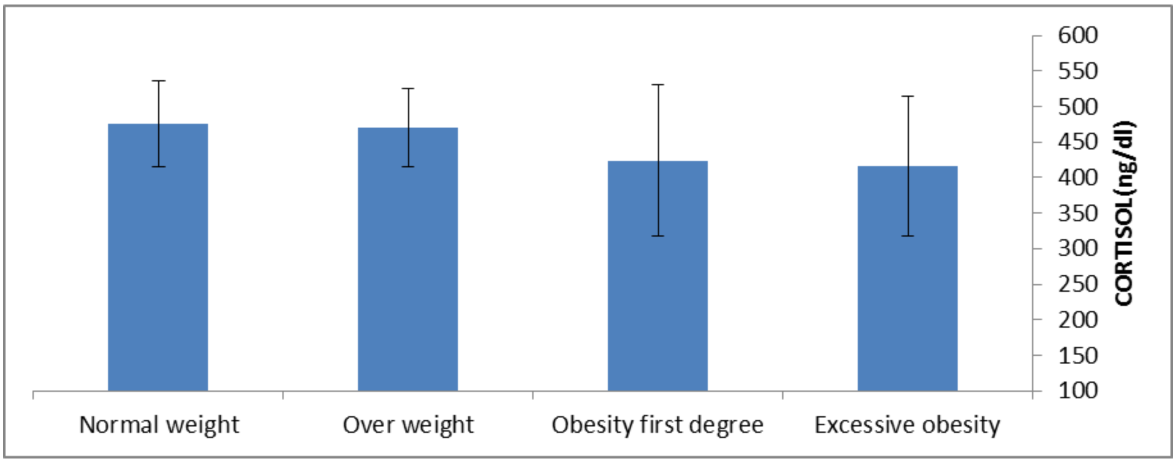
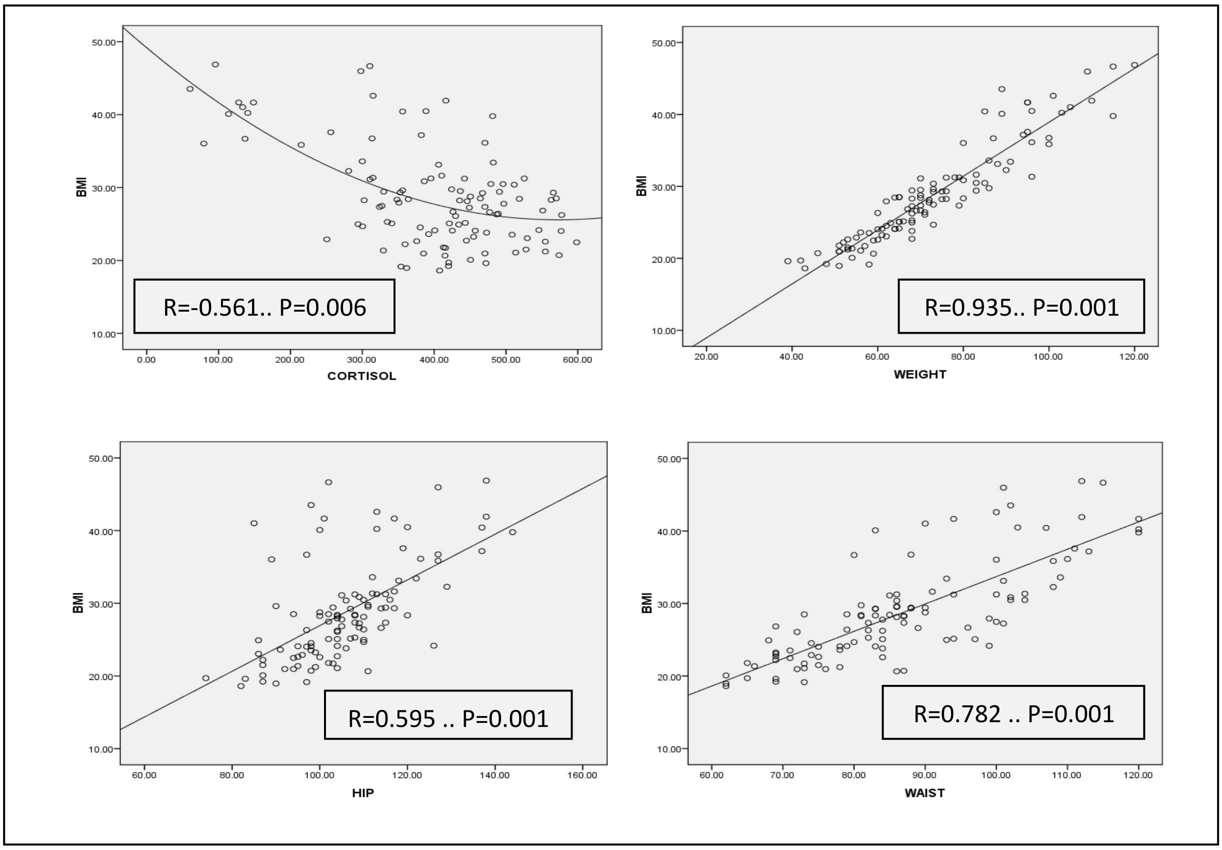


Figure No. (3.1): shows the level of cortisol concentration of the BMI groups.

The study of the correlation between the BMI and the studied indicators showed a negative correlation with the cortisol concentration (r = - 0.561-P=0.006), and a positive correlation were with weight (r = 0.935-P=0.001), waistline (r = 0.782-P=0.001) and hip (r = 0.595 - P=0.001). while the result showed no correlation with height (r = 0.151 - P=0.121) as shown in figure (3.2). The negative correlation was between the cortisol and weight (r = - 0.486-P=0.001) and, waistline (r = - 0.359-P=0.001), while no correlation was found between the cortisol and hip (r = - 0.094-P=0.337) and, height (r = 0.146-P=0.132) as shown in figure (3.2).



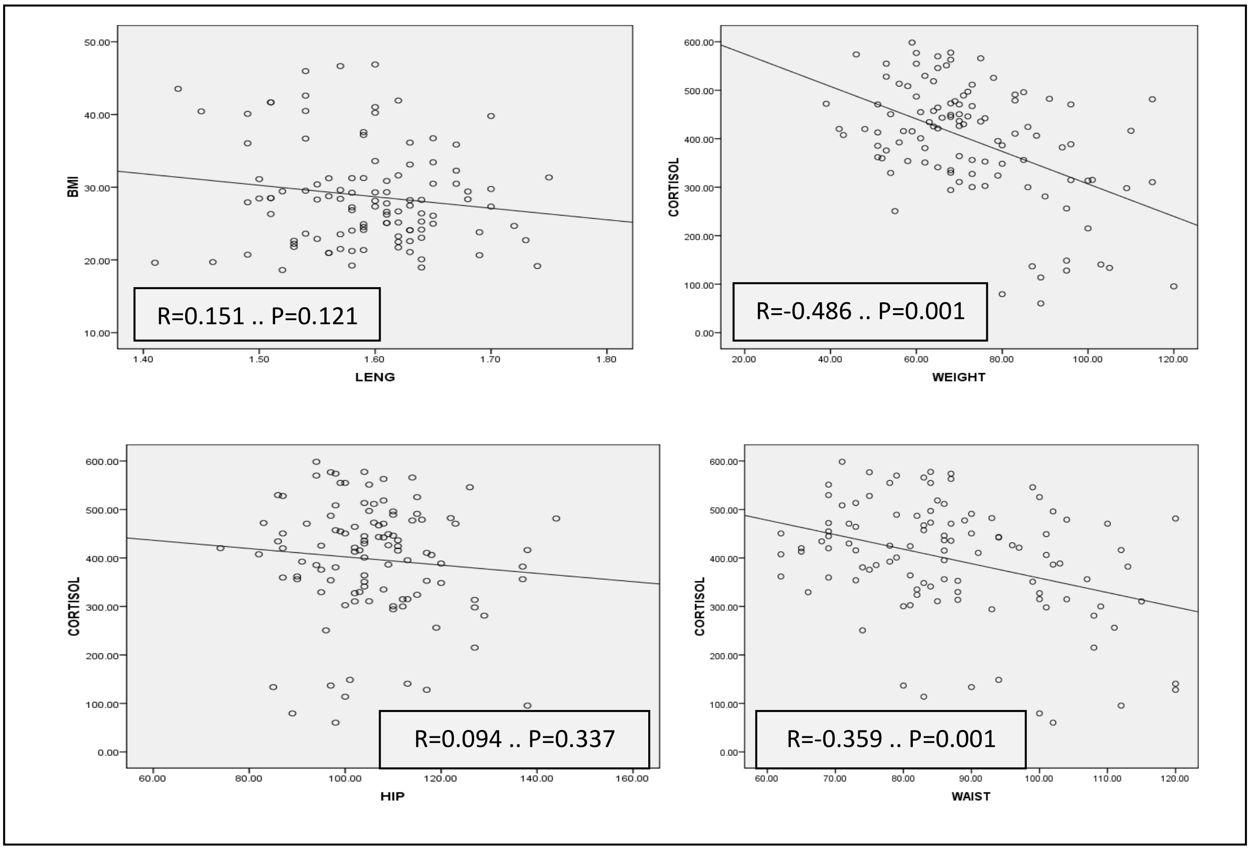


Figure No. (3.2): shows the correlation between cortisol and the studied indicators.

DISCUSSION

From the questionnaire, we have included those who are not taking any medications that influence normal cortisol secretion. The obesity seems to be acquired from the life style, were no activity or any kind of sports nor they work regularity (long sleep) eating fast food rich in sugar with high calories.

In this study, complete blood count was measured, which were included in the study of the cellular count of blood: hemoglobin, red blood cells, white blood cells, platelets, which are useful in diagnosing and monitoring many diseases, as well as to verify the presence of a defect or damage in the blood-forming organs. Hematological abnormalities have been associated with many health problems, for example coronary heart disease (CHD) and oxidative damage.[9-10] The results of this study showed that there were significant changes (increase) in some blood values, (HB, RBC and WBC) which increased by increase the BMI, except for platelet which show no change. Obesity has been associated with high hemoglobin concentration, red blood cell count, hematocrit and white blood cell count as in previous studies.[11-12-13] Elevation in erythrocyte count, hemoglobin, and hematocrit in obesity is unclear. Iron deficiency is common in overweight and obese individuals, and increased blood volume in these individuals may lead to increased hemoglobin mass and iron requirement. Morbid obesity has also been shown to be the cause of physiological leukocytosis.[11] A recent study showed that overweight and obese women had higher levels of interleukin-6 (IL-6), hepcidin, hemoglobin, and soluble transferrin receptor (sTfR) than women of normal weight.[14] The Increase in hemoglobin mass may explain the increase in iron requirement for erythropoiesis in overweight and obese women.[15] On the contrary, Barazzoni's study showed that body mass index or obesity in itself is not associated with high red blood cells, hemoglobin and hematocrit, and that the accumulation of abdominal fat and insulin resistance mediate the overall correlation between BMI and hematological abnormality.[16] The current study showed that there was no significant differences in platelets between the different groups of BMI. However, Tuba Tulay Koca's study shows that, there is a difference in platelet count between BMI groups.[17]

Serum cortisol testing is commonly requested for diagnosis of many abnormal conditions eg Cushing's syndrome and adrenal insufficiency, but finding low cortisol may cause concern and further investigation.[18] Therefore, it is important to understand the factors that affect the cortisol level in blood. Cortisol concentration in blood is generally normal in obesity. This study showed that, cortisol concentration was lower in female with high BMI than in female with normal BMI, this was statistically not significant, as mentioned in other studies.[19-20] Some studies that stimulated cortisol measurement or used a 24-hour urine cortisol have reported that, the concentration of cortisol was higher in overweight and obese.[21-22-23-24]

The relationship between cause and effect obesity and cortisol is not clearly known. This may be due to a change in hypothalamic, pituitary, and adrenal secretions in obesity, resulting in poor daily variability in cortisol levels, with lower morning and higher evening cortisol.[25] Andrew explained that the decreased morning cortisol concentration may be a result of the enhanced metabolic clearance of cortisol in obese subjects, which is partially compensated by increased cortisol secretion.[26]

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